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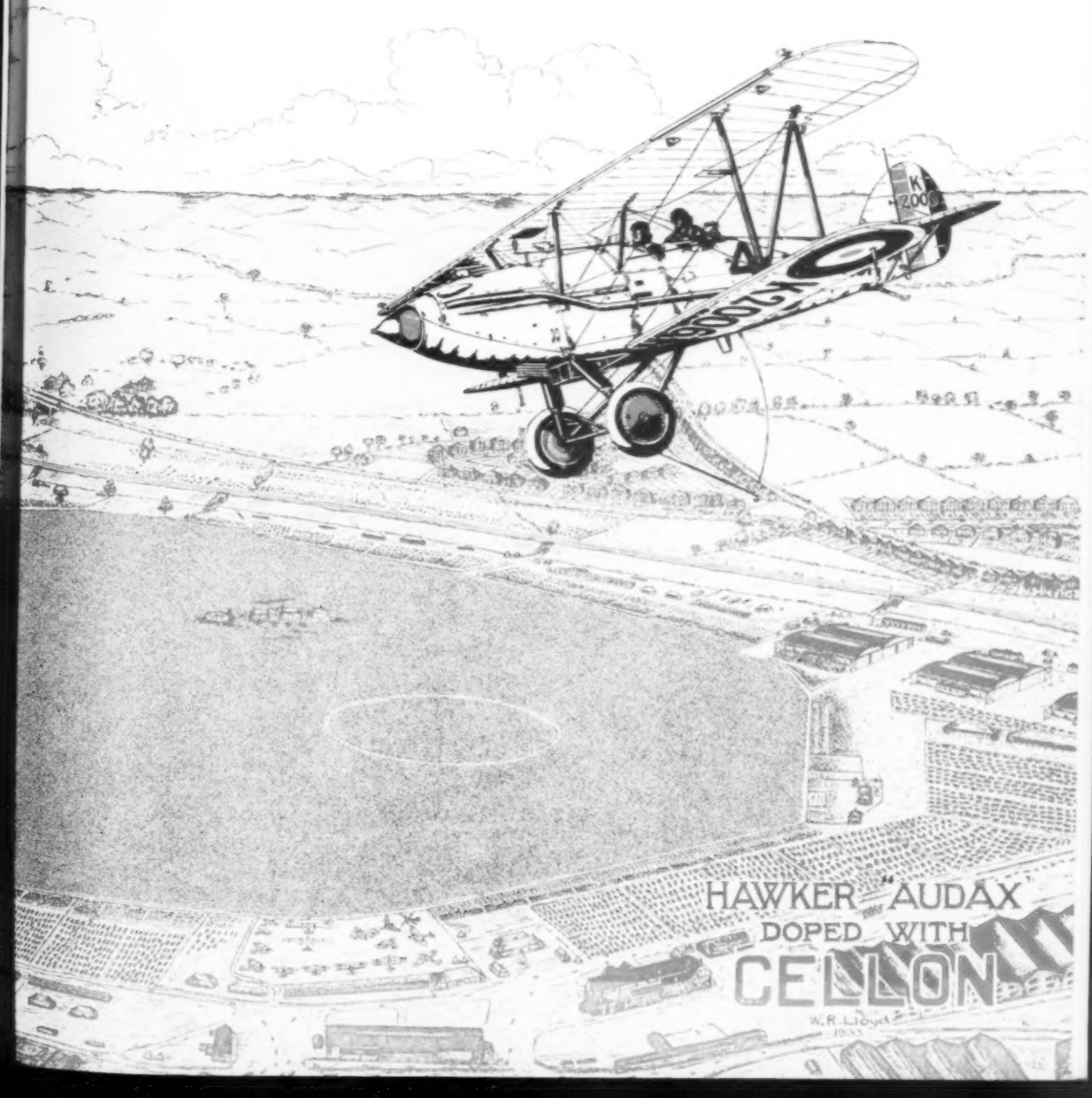
FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

No. 1274
Vol. XXV
No. 21

SIXPENCE
EVERY THURSDAY



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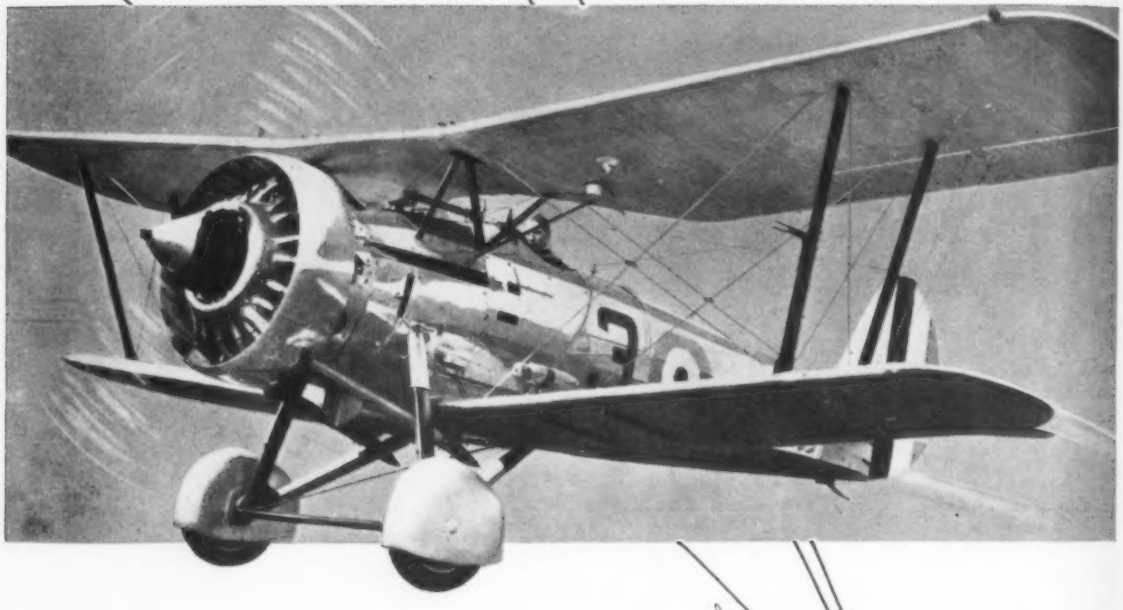

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor: STANLEY SPOONER

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list :—

1933.
May 25. Opening of Royal Tournament, Olympia.
May 25. Tourist Rally at Wiesbaden.
May 27. Portsmouth Ae.C. Opening, 3.15 p.m.
May 27. Reading Ae.C. Annual "At Home."
May 28. Deutsch de la Meurthe Cup, Etampes.
May 29. Opening of R.A.F. Rifle Association's Meeting at Bisley.
May 30. Wilbur Wright Memorial Lecture before R.Ae.S.
May 31. Entries close at double fee for King's Cup Race.
June 4. Skegness Flying Meeting.
June 5. "Morning Post" Race, Heston.
June 5. Northamptonshire Ae.C. Annual Air Pageant.
June 7. Household Brigade Flying Club Meeting.
June 10. Lincs. Ae.C. Air Pageant and Opening of Aerodrome at Holton-le-Clay, Grimsby.
June 10. Henly's Rally, Heston.
June 10. Close of Royal Tournament, Olympia.
June 11. International Meeting, Brussels.
June 15-18. Aero Club of France Tourist 'Plane Meeting, Orly.
June 16. Mayor's Aerial Garden Party, Eastbourne.
June 16-17. Opening of Inverness Municipal Airport.
June 17. Bristol Airport Flying Meeting.
June 17. S.B.A.C. Race, Shoreham-Bristol.
June 17. Charity Air Display at Maidstone Airport.
June 17-18. Ae.C. du Rhone International Meeting, Lyon.
June 20. Princess Mary's R.A.F. Nursing Services Afternoon Reception, Claridge's.
June 21. Official Opening of Norwich Municipal Airport by H.R.H. the Prince of Wales.
June 23. R.A.F. Dinner Club Dinner, Connaught Rooms.
June 24. Royal Air Force Display, Hendon.
June 24. Comrades of the R.A.F. Rally at Thames House.
June 26. S.B.A.C. Aircraft Display and Exhibition, Hendon.
June 27. Press Visit to the National Physical Laboratory, Teddington.
July 8. King's Cup Air Race, Hatfield.

EDITORIAL COMMENT

"IN view of the obscurity of the International political situation, notice is hereby given that it has been decided to postpone indefinitely the INTERNATIONAL AIR RACES which were to have been held at Portsmouth on the 4th, 5th and 7th of August next." This is the brief text of a letter sent out by the Organising Secretary of British and International Air Races, Ltd., from 24, Throgmorton Street, London, E.C.2. The letter is dated May 18. In view of the hints of interesting entries from abroad, entries promised by famous pilots, and so forth, sent out from time to time during the last few weeks, the announcement comes as something of a bomb shell. When the information first became available that a company was to be formed for promoting air racing on a large scale, and it was announced that ample funds had been guaranteed to ensure really substantial prizes being offered, the news was welcomed on all sides. Not for many years had we had in England any air race in which the prizes to be won were such as to justify manufacturers producing special aeroplanes for participation. Now at last, it seemed, British designers were to be given an opportunity to show the world what they could do when adequately backed, and when it was announced that the first of the meetings was to be held at the Portsmouth aerodrome during August Bank Holiday week-end, and that prizes totalling £5,000 were to be offered, quite a number of designers at once got busy on new types, while others looked into the question of modifying existing types, substituting different engines, and so forth, with a view to getting machines suitable for the three classes into which the competing machines were to be divided at the Portsmouth meeting.

"Indefinitely Postponed"

Now, suddenly, in the middle of all this enthusiasm comes the bald announcement that the meeting is "off." The reason given will be described by most people as feeble in the extreme. "The obscurity of the political situation" is no murkier than it was a month ago. In fact, at the moment, the reverse. Hitler has sent out a peace dove. Great Britain, France, Germany and Italy have got down to a ten-

years' peace proposal, and at the best, disarmament will begin at once and would have been in time for all the single-seater fighters of Europe to shed their guns and come to Portsmouth to race in the "unlimited" class! Nothing obscure in that, surely! But perhaps it was felt that if all those fighter pilots from several European countries were to meet at Portsmouth, and there be in danger of competing with each other as well as with some "famous American pilots," they might turn the race into a war and provide "incidents" for Geneva.

The real reasons for the postponement of the races at Portsmouth will probably never be made known to the general public, but one would have thought that a more plausible explanation than the "obscure political situation" could easily have been found. From every point of view the decision to cancel the races is regrettable. At home several designers have worked hard to get out drawings for machines, and have been put to a great deal of expense which some of them at any rate can ill-afford. In other cases plans for alterations were maturing, if work had not already been begun, and, again, a lot of trouble has been caused.

Abroad the effect cannot be other than undesirable. If the information sent out during the last few weeks means anything at all, it means that a number of foreign aircraft concerns and individuals have been approached, and that, although no definite entry was made, quite a number of entries had been promised. For example, both France. Italy and the United States, we understand, had in this way promised to enter machines. The opinion which these nations must form of a British attempt to hold an international speed race will of necessity be very poor, and if anyone should revive the idea of organising such races next year, the foreign competitors may well ask themselves whether it is likely to be worth while to build machines for an event which may, according to precedent, be cancelled at the last moment. The fact that no definite entries had been made is of relatively small importance. Compared with the cost of building machines, or even with modifying existing machines to make them suitable, the entry fee of £25 is insignificant.

Altogether, the cancellation of the International Air Races at Portsmouth is one of the most regrettable incidents in British aviation for very many years, and it is, unfortunately, one which will take a lot of "living down."

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The Deutsch Cup

On Sunday next, May 28, the race for the Deutsch de la Meurthe Cup will be flown over a triangular course, with start and finish at Etampes. Eight machines, seven of them French, passed the qualifying trials and will, presumably, take part in the race. The only British entry, the Comper "Swift," fitted with a "boosted" De Havilland "Gipsy Major" engine, to be piloted by Mr. "Nick" Comper himself, will have a difficult task to face. Some of the French machines are fitted with new supercharged engines stated to give more than 400 h.p., compared with which the bare 150 h.p. of the "Gipsy Major" looks insignificant. But the race is a long one (two laps of 622 miles each), and much may happen. Reliability will count for a good deal, and even on a horse-power basis the British entry is by no means as hopelessly outclassed as the figures might seem to show, especially in a race of this length. The more powerful engines will require correspondingly more fuel, and if landing speed is to be kept to a reasonable figure, this will mean that the machine itself must be larger. Within reason, the larger the machine the less handy it is on the turns, and as there will be a large number of turns to be made in the circuit, this will have an important bearing on the average speeds put up. We feel that "Nick" may be relied upon to give a good account of himself, and he will carry with him the best wishes of all who have the honour of British aviation at heart. One very encouraging feature is that Comper has such faith in his machine and engine that he is flying across to Etampes.

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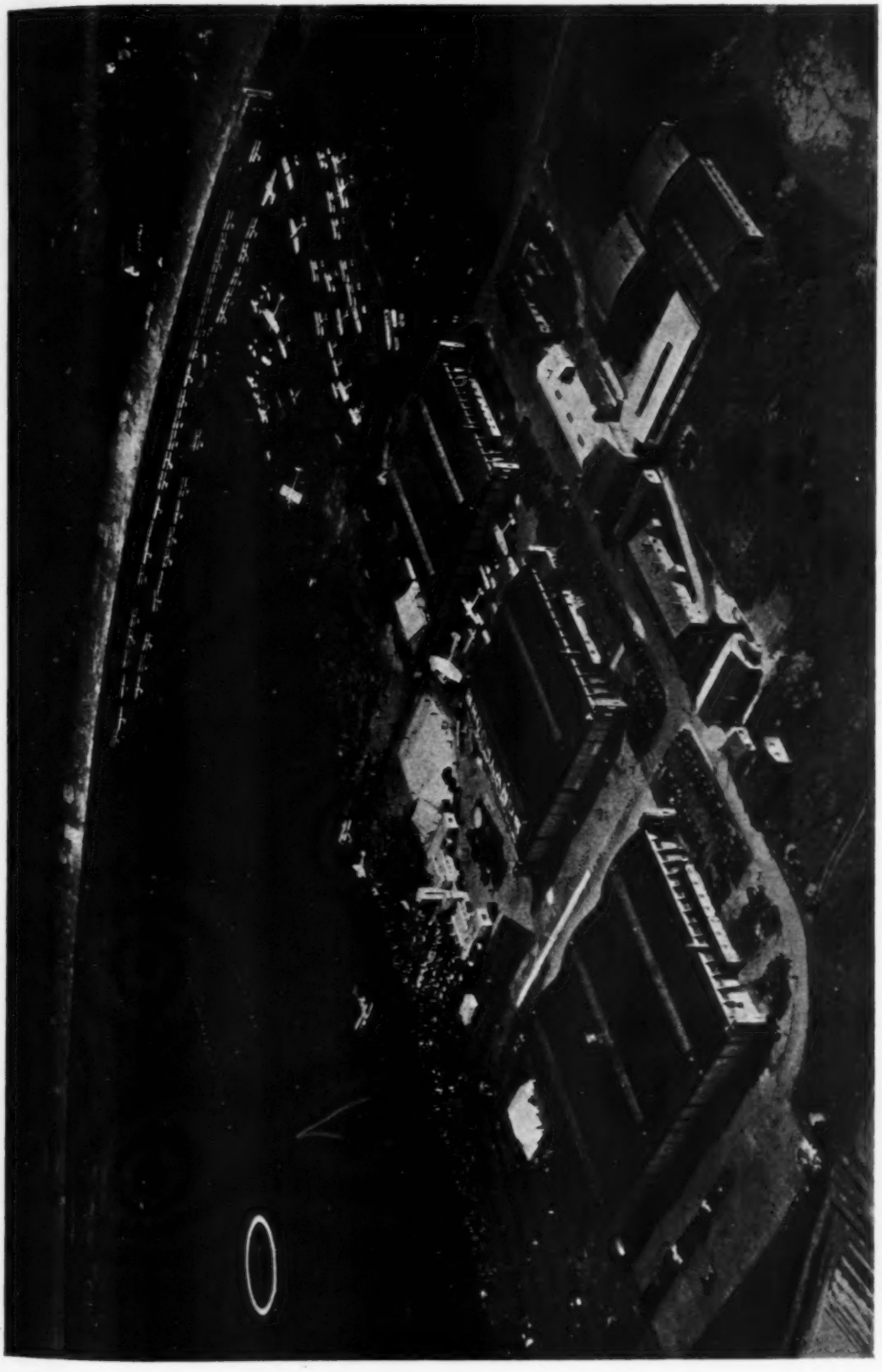
Royal Encouragement

It would be difficult to imagine anything better calculated to encourage flying among those who matter than the regular and extensive use which members of the Royal Family make of the aeroplane as a means of enabling them to attend the many official functions in different parts of the country. H.R.H. the Prince of Wales in particular has done invaluable service to British aviation by his preference for the aeroplane. He has been the owner of a number of machines, and quite recently he has taken delivery from Vickers (Aviation), Ltd., of a "Viastra," fitted with two Bristol "Pegasus" engines. In this machine his Royal Highness has already made a number of trips, piloted by Flt. Lt. Fielden, including a visit to the G.A.P.A.N. meeting at Brooklands last Saturday. There the Prince's new machine was, naturally, a centre of interest, and if the onlookers could have examined the interior they would have been even more impressed. His previous machines have been comfortable enough, but they have been fairly small aeroplanes, and there has been no real opportunity for interiors in keeping with the exalted position of the owner. In the "Viastra" the Prince of Wales has at last a machine large enough to carry not only His Royal Highness but also any reasonable number of his suite whom he may wish to accompany him on his travels. Should, later on, His Royal Highness wish to go abroad by air, he can now do so in a style befitting his station, and we hope G-ACCC will be a familiar sight not only at home but in many places on the Continent during the coming summer.

An Unwise Plan

On June 4 or 5 Mr. and Mrs. Mollison propose to fly to New York in their D.H. "Dragon" (2 "Gipsy Majors"). After but a short rest they intend to fly east from New York as far as they can. Given the average following winds which are to be expected when flying east from America, they appear to stand a very good chance of raising the world's long-distance record. This is a laudable object. What does seem to us so unnecessary is that the Mollisons should hazard their chances of doing so by first flying the machine to New York. We fail to see the object in thus risking their lives and their machine *before* they have attempted the real record flight.



HOUSE FULL : Ninety aeroplanes were to be seen at Brooklands last Saturday. Here are 89 of them—our photographer was using the ninetieth. The two "Furies" from No. 1 Squadron can be seen at the extreme ends of the track. (FLIGHT *Photo.*)

PUBLIC INTEREST : When he visited Brooklands for the G.A.P.A.N. Meeting last Saturday, the Prince of Wales' "Viastra" (2 Bristol "Pegasus" engines) was greatly admired. Our photographer found it difficult to get an unobstructed view of the machine. (FLIGHT *Photo.*)

G-ACCC

His Royal Highness the Prince of Wales has recently taken delivery of a Vickers "Viastra," fitted with two Bristol "Pegasus" Engines

THE Vickers "Viastra" all-metal monoplane, fitted with two Bristol "Pegasus" engines, built for H.R.H. the Prince of Wales for personal travel in this country and abroad, is an improved edition of the machines which have been successfully operating on Australian air lines.

The machine has a span of 70 ft., is 45 ft. 6 in. long, a roomy cabin 19 ft. 9 in. long, 5 ft. wide, 6 ft. 1 in. high, and 70 cu. ft. of luggage space. The machine has a normal range of 700 miles and a cruising speed of 130 m.p.h. By the addition of an extra tank, carried under the fuselage, the range is increased to 1,050 miles. The two "Pegasus" engines are situated one on either side of the cabin close up to the underside of the wing, and are fitted with Townend rings and exhaust collector rings with outlets over the plane. Starting is by means of hand- or electrically-operated "Eclipse" inertia starters. The machine is fitted with complete side-by-side dual control. Both seats are adjustable and arranged so that a back type G.Q. Parachute can be clipped to the pilot at a moment's notice.

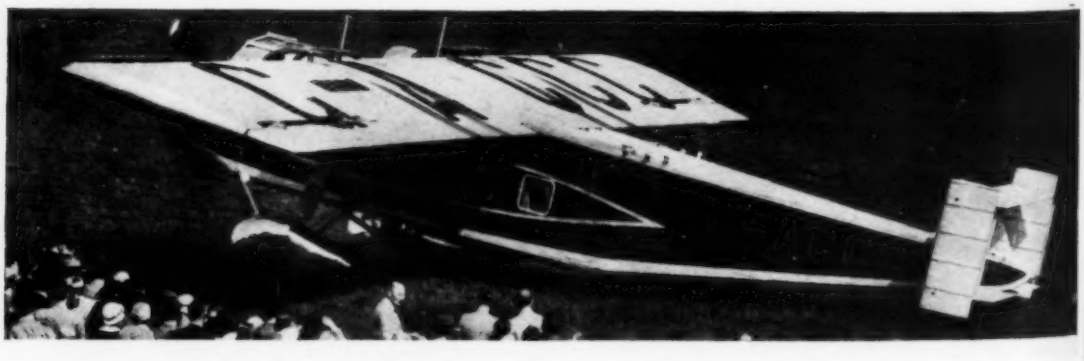
The instruments on the dashboard are luminous and all lit by indirect lighting. They include a red bullseye, which is in operation until the rear door is locked. The control of the steerable Vickers-Dunlop hydro-pneumatic brakes is situated on the spectacle grip control wheel, behind which is also the remote controls for the wireless and landing searchlight sunk in the outer portion of the left wing. A K.L.M. type drift indicator is fitted between the two pilots' seats, with a tunnel for through vision.

The furnishing of the cabin has been artistically carried out in veneered woods, all Empire-grown. Between the panelling and the Balsa wood bearers a layer of chamois leather has been placed to lower the resonating sounds. The whole surface of the inner side of the outer cabin skin is covered with special Hairlok and dry zero blankets of varying thicknesses, specially produced by the builders. This, coupled with a special fireproofed air-tight paper partition and double-thickness insulated windows, has produced a cabin quieter than an express train. Special care has been taken to see that the Air Ministry regulations as regards fireproofing have been adhered to, so that smoking is quite safe.

To meet the special requirement of utilising the space in the cabin to the greatest advantage, and of making it as comfortable as possible for long journeys, the whole of the equipment has been designed and manufactured in the works. Some of the principal features are as follow:—

Light alloy chairs are installed, the back of which can be set at any angle, and which can be set facing either forward or aft, or can be turned into a bed. The padding for these is moulded Hairlok.

A special electrically-driven clock with dial worked in the panelling is fitted.



THE ARRIVAL AT BROOKLANDS : The Vickers "Viastra" G-ACCC, carrying H.R.H. the Prince of Wales, and piloted by Flt. Lt. Fielden, coming to a standstill. (FLIGHT *Photo.*)

The electric lights, four on each side of the cabin, have Tungum alloy frames with peach-colour glass, engine-turned flush switches.

Electric radiators on each side of the cabin are mounted flush with panelling at floor level. These are made to come out, so that if necessary they can be used as foot-warmers. The switches for these are of the same external design as those for the lamps, but have to deal with 40 amps. Two tables can be placed anywhere on the chair tracks.

So as to do away with ugly hat-racks, special hat-clips are placed at intervals on each side of the cabin. By means of two curtains the cabin can be, if necessary, divided into three compartments of varying size.

Ventilation is provided by four incoming ducts on each side of the cabin, leading through what look like miniature loud speakers. Two air exits are provided in the roof at the rear end. Additional to this, the two central windows on each side open outwards, hinged horizontally at the top.

Provision for cuspidors, lifebelts, periodicals, etc., is all in the form of flush pockets in the panelling, and is thus in symmetry with the whole design. All handles, stops and catches have been specially made in keystone design to blend with the angular theme and motif.

On the left-hand side, beneath the pilot's seat, is a complete A.D. 6M wireless set, having telephonic transmission and reception range of 300 miles. Besides the ordinary trailing aerial a fixed aerial is fitted.

Six parachutes are carried in the cabin roof and a further two, if necessary, under removable tip-up seats. In the door between the main cabin and the lavatory compartment is a complete cocktail cabinet, so arranged that when the cabinet is in use the door cannot be opened. An electrically-heated kettle and complete equipment to make tea for all on board is provided, the necessary utensils being of unbreakable Bandalasta ware.

At the rear end of the cabin storage for writing is made, again in a flush compartment. Aptly situated below this is a panel that, when folded upwards, forms a table for a typewriter.

The pleasing effect of the handsome panelling in the cabin has been obtained by a careful selection of the following grades of wood:—Weathered Sycamore mottled for the roof and down to top of the window. A dado line of Kingwood. Weathered Sycamore, straight figured. Australian Maple. Australian Walnut (the skirting).

The design of the decorative woodwork surface was carried out by Mr. Oliver P. Bernard. All notices in the cabin have been made by inlaying woods of opposite colour into the panelling.

The entrance hall, cum lavatory, has the latter completely divided off, if necessary, by a 45° movement of the rear cabin door. The flooring is of patterned cork, the basin of marble-coloured Bandalasta, the water tap a monolithic design of duralumin, dyed pale green, the mirror, to save weight, has been made in ⅛-in. splintex.

Continuing aft, behind a bulkhead, is the rear luggage compartment, in which is a complete refrigerating plant with a capacity of approximately 1½ cu. ft., and stowage for an Imperial portable typewriter and an H.M.V. gramophone and records. All these can be reached from the main saloon. This compartment is also fitted with a small wardrobe.

The machine is fitted with Handley-Page slots, Vickers Oleo Units and Vickers Oil Coolers.

Both the undercarriage wheels and tail wheels are fitted with spats.

THE FIRST INTERNATIONAL AUSTRIAN ALPINE FLIGHT

THE International "Rally" in connection with the Alpine Flight took place on May 16 and 17. According to the information at present to hand, the order of the arrival of the rally was Capt. Jersy Bajan first, flying a P.Z.L. 19 ("Gipsy Major"), and Capt. Piotr Dudzinski second, also flying a P.Z.L. 19 ("Gipsy III"). Col. the Master of Sempill, one of the two British arrivals, was fourth with his "Puss Moth" ("Gipsy III") and Mr. A. B. Gibbons, the second British entry, was fourteenth on his "Klemm L.25" ("Pobjoy").

As we published on March 2, the first part of the meeting was the cross-country rally, finishing at Wiener-Neustadt, the aerodrome situated 31½ miles south of Vienna. The second part was a flight at top speed between this aerodrome and Vienna (Aspern), and the third and last part was three consecutive days flying over the Alps. During these three days a method of handicapping was used, which was somewhat complicated, and it is not therefore expected that the results will be available for some little time.

The rally as far as Wiener-Neustadt was definitely a test of navigation, the pilot gaining points for long range and high-cruising speed. The flight to Vienna (Aspern) was to determine the top speed of the machines and the order in which they should leave for the main part of the Alpine Flight. Ability to win marks on this part of the flight depended upon the machines capability of getting into and out of small fields rather more than on high speed. There were over 100 landing fields, most of them optional, and by landing in them it was possible to gain from 100 to 850 points, according to the size and position of the field. A great disappointment to the other competitors was the fact that six German pilots were not allowed to compete. The third English entrant, Mr. A. J. Richardson (Klemm, Salmson), despite his 71 years, had intended to take part in the meeting, but, unfortunately, he met with a slight mishap *en route* and was, therefore, debarred from doing so.

In the rally Mr. Gibbons flew a course from Heston to Cologne, Regensburg, along the Danube via Passau, and so to Wiener-Neustadt. Col. Sempill also went from Heston, but direct to Lausanne and Friedrichshafen before reaching his final destination. Owing to the marks obtainable for the long distance flown in this rally, some competitors made rather amusing detours to reach their objective. For example, Capt. G. von Brumowsky, in a "Fox Moth" ("Gipsy Major"), started from Vienna (Aspern) and went to Wiener-Neustadt via Munich, Amsterdam and Friedrichshafen. A Hungarian pilot, Josef Szegedi, flew over 1,500 miles during the rally from Budapest to Austria via Milan and southern Italy, but the record was taken by the Polish pilot Piotr Dudzinski, who flew to Moscow and Leningrad in order to gain as many marks as possible and covered, in all, 3,000 miles. His P.Z.L. 19 was the same type as recently flew the Atlantic, and became a favourite for the whole meeting on his arrival at Wiener-Neustadt. An hour after the closing time of the arrival of the rally, the machines were sent at one-minute intervals to Aspern, some of the fastest times being:—Bajan, 14 min. 23 sec.; Dudzinski, 15 min. 11 sec.; Master of Sempill, 16 min. 55 sec.; the distance between the aerodromes being 31.25 miles.

Prince Kinsky, the President of the Austrian Aero Club, gave a tea party in his palace for the pilots on Thursday, May 18, at which Dr. Dolfuss, the Austrian President, and many other prominent citizens were present. Over six months have been spent on the preparations for the Alpine Flight, and everything which could be done to assist the competitors was done. They were given full details of all the landing grounds, including a full-page diagram of each, illustrating the best approach and take-off. There were also rescue parties and scout planes ready in case of bad weather or accidents. Friday was rather a day of mishaps. Everyone started early, and by 3.30 a.m. the majority were on their way to the aerodrome. Everyone was ready for the start by 5 a.m. Bajan was undoubtedly the favourite at the start, as his low wing monoplane, with slots the whole length of the wings, was considered a formidable combination of manœuvrability and speed. Unfortunately news came through very early that he had flown into a tree, causing the machine to burst into flames. Both Bajan and his co-pilot, however, managed to get clear with but slight injuries. At Kinittel one of the Italian pilots, Amadeo Micciani, on a S.A. Caproni (C.A. 100) (Colombo), made a forced landing which unfortunately resulted in turning the machine on its back. Another Italian, Andrea Zotti, also suffered the same misfortune near Vienna. A Hungarian pilot, Ladislaus Kalman, was forced to land with engine trouble, and a countryman of his, Michael Nagy, damaged his undercarriage badly during one of the landings. Both

(*Concluded on page* 506)

The Deutsch De La Meurthe Cup

Eight Machines Pass Qualifying Trials

AS described in FLIGHT of February 9, 1933, each plane entered for the Deutsch de la Meurthe Cup was required to make a qualifying flight of 100 km. (62½ miles) at the rate of at least 200 km./hr. (125 m.p.h.) before 45 min. after sundown on Sunday, May 14, last. Eight machines easily accomplished this test, and have been declared eligible to compete for the Cup on May 28 next. The list is as follows:

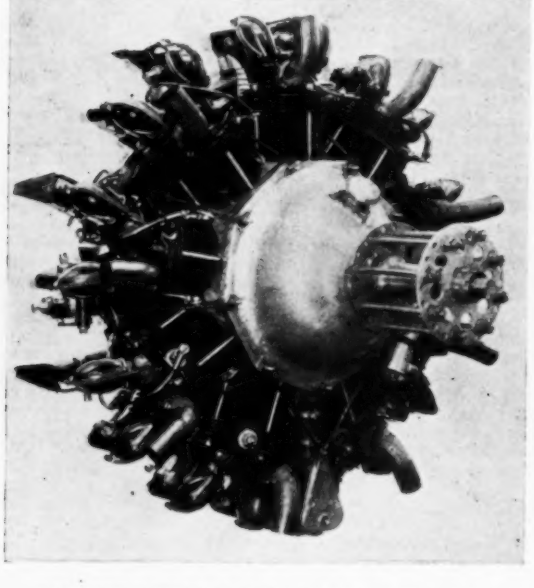
Plane	Engine	Type	H.P.	R.p.m.
Farman	Farman ..	" 12 Brs." water-cooled 12-cylinder, inverted in two banks at 60°	420	4,000 supercharged and geared.
Farman	Renault ..	" Bengali Special," air-cooled 4-cylinder in line	170	2,500 direct drive.
Potez	Potez	" 9 B " 9-cylinder air-cooled radial, equipped with a NACA-type cowling	310	2,500 supercharged direct drive.
Potez	Potez ..	" 9 B " 9-cylinder air-cooled radial, equipped with a NACA-type cowling	310	2,500 supercharged direct drive.
Caudron	Regnier ..	6-cylinder inverted air cooled	220	2,450 direct drive.
Caudron	Renault ..	" Bengali Special," air cooled 4 cylinder in line	170	2,500 direct drive.
Caudron	Renault ..	" Bengali Special," air cooled 4 cylinder in line	170	2,500 direct drive.
Comper-Swift ..	de Havilland	" Gipsy Major Special," air cooled 4 cylinder in line	146	2,400 direct drive.

The Kellner-Bechereau plane, equipped with a Delage 370 h.p. water-cooled motor, developed engine trouble during its trial flight on Sunday afternoon, May 14, last, and was badly damaged in landing. It was consequently obliged to withdraw. The two Albert machines, which were both to be equipped with Regnier engines, could not be got ready in time, and were also obliged to withdraw. The other two original entries, a Farman plane (" Hispano-Suisa " engine) and a Caudron plane (" Baudot " engine) were cancelled some time ago.

As was described in FLIGHT, May 18 last, the sole foreign entry in the Deutsch Cup race is a Comper " Swift " high-wing monoplane. This is the machine entered by H.R.H. the Prince of Wales, and flown in the King's Cup race last year by Flt. Lt. Fielden, putting up an average speed of 155.75 m.p.h. For the Deutsch Cup the machine has been " cleaned up " considerably, and the " Gipsy Major " engine has had its compression ratio increased to 6:1. The engine is also being run slightly faster than the normal, so that the power developed is approximately 146 b.h.p. The capacity is 6.12 litres.

The two Potez planes entered will be equipped with the new Potez type 9B " Radial " 9-cylinder, air-cooled, supercharged direct-drive engine, especially designed for this Deutsch Cup race. The characteristics are as follows: Cylinder displacement, 9 litres (549 cu. in.); bore, 98 m/m. (3.85 in.); stroke, 117 m/m. (4.60 in.); compression ratio, 6:1; r.p.m., 2,500; maximum power, 310 h.p. at 2,500 r.p.m.; supercharger, centrifugal type; r.p.m. of supercharger, 11.5:1 (engine supercharged, 45 per cent. at ground level); total weight empty, 170 kg. (374 lb.); maximum frontal diameter, 950 m/m. (37.41 in.).

Some interesting performances, which give promise of establishing new light plane speed records, were shown in these recent trial flights. A Potez plane, after making its qualifying trial flight at 225 km./hr., is reported a few



FOR THE DEUTSCH CUP : On the left the Potez 9B radial engine. On the right the cockpit of the Comper " Swift," piloted by Flt. Lt. N. Comper.

THE ONLY BRITISH COMPETITOR : The Comper "Swift" ("Gipsy Major") piloted by "Nick" Comper.
(FLIGHT *Photo.*)

days later to have flown at a speed of 390 km./hr. (242 m.p.h.). It is expected to make 400 km./hr. or better in the Deutsch Cup race. Other planes have attained speeds considerably better than 300 km./hr.

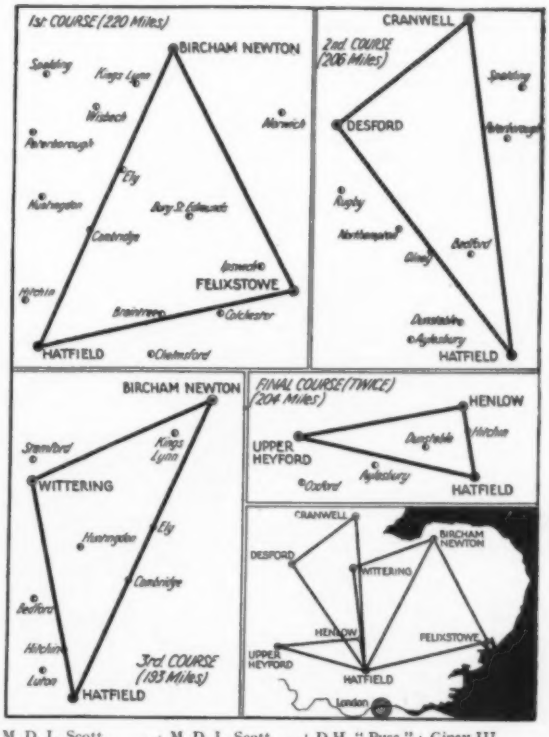
A description of the Potez planes and other machines, together with their engines, entered in the Deutsch Cup race were given in FLIGHT of May 18 last.

This Deutsch de la Meurthe Cup contest will be a speed race of 2,000 km. (1,240 miles), divided into two flights of 1,000 km. each, with an interval of one and a-half hours between them (as described in FLIGHT, February 9, last). According to the final announcement of the Aero Club of France, the circuit will be a triangular one of 100 km. (62½ miles) in length, composed of Etampes (Mondesir Aerodrome), Chartres Aerodrome, and Bonce. The start and finish will take place at the Mondesir Aerodrome. The course will be flown ten times in the morning and ten times in the afternoon. R. C. W.

THE KING'S CUP AIR RACE, 1933

THE Royal Aero Club announce the following entries for the King's Cup Air Race to be held at Hatfield on Saturday, July 8, 1933. Late entries may be received up to May 31.

ENTRANT.	PILOT.	AIRCRAFT.	ENGINE.
Hon. Lady M. Bailey	Lady Bailey ..	D.H. "Puss" Moth	Gipsy Major.
Edgar William Hart ..	A. P. K. Hattersley	D.H. "Puss" Moth	Gipsy III.
E. L. Gandar Dower	A. C. S. Irwin ..	D.H. "Puss" Moth	Gipsy III.
Mrs. Doris Sale ..	Capt. A. M. Diamant	D.H. "Puss" Moth	Gipsy III.
Charles G. Grey ..	F/O. H. H. Leech	Arrow "Active"	Gipsy III
Alexander Henshaw	Alexander Henshaw	Comper "Swift"	Pobjoy.
Theodore Cecil Sanders	T. C. Sanders ..	Martlet ..	Genet II.
Sir William Morris ..	P. E. G. Sayer ..	Hawker "Tomtit"	Wolseley AR. 9.
Sir William Morris ..	Flt. Lt. P. W. S. Bulman	Hawker "Tomtit"	Wolseley AR. 9.
Sir William Morris ..	G. E. Lowdell ..	Hawker "Tomtit"	Wolseley AR.9.
Lt.-Com. E. W. B. Leake	E. W. Percival ..	Percival "Gull"	Napier "Javelin."
Lt. Col. L. A. Strange	L. A. Strange	Spartan "Clipper"	Pobjoy.
Wing. Com. H. M. Probyn	H. M. Probyn ..	"Hawk" ..	Cirrus III.
L. Lipton	L. Lipton	D.H. "Gipsy" Moth	Gipsy III.
W. L. Runciman ..	W. L. Runciman	D.H. "Puss" Moth	Gipsy III.
Sir Philip Sassoon ..	F/O. G. R. A. Elsmie	Percival "Gull"	Napier "Javelin."
Woolf Barnato ..	Flt. Lt. E. A. Healy	Arrow "Active"	Hermes IIB.
Carill S. Napier ..	C. S. Napier ..	Hendy ..	Hermes IV.
H. M. Schofield ..	H. M. Schofield ..	Monospar ..	2 Pobjoy.
S. A. Sadler	Capt. W. L. Hope	Comper "Swift"	Gipsy III.
Lord Wakefield ..	Capt. H. S. Broad	D.H. "Dragon"	Gipsy Major.
Capt. Geoffrey de Havilland	G. de Havilland ..	D.H. "Leopard" Moth	Gipsy Major.
A. S. Butler	Mrs. A. S. Butler ..	D.H. "Leopard" Moth	Gipsy Major.
Flt. Lt. E. H. Fielden	E. H. Fielden ..	Comper "Field Mouse"	Gipsy Major
Viscountess Hardinge	Flt. Lt. E. C. T. Edwards	Comper "Swift"	Pobjoy.
F. R. Walker ..	F. R. Walker ..	Comper "Swift"	Gipsy III.
Sir Norman J. Watson	—	Comper "Swift"	Gipsy Major.
Flt. Lt. N. Comper ..	—	Comper "Field Mouse"	Pobjoy.
Air Vice-Marshal A. E. Borton	A. E. Borton ..	Percival "Gull"	Napier "Javelin."
Sir Derwent Hall-Caine	—	D.H. "Leopard" Moth	Gipsy Major.
M. D. L. Scott ..	M. D. L. Scott ..	D.H. "Puss" Moth	Gipsy III.
The Hon. Richard Westenra	R. Westenra ..	D.H. "Puss" Moth	Gipsy Major.
W. S. Stephenson ..	E. D. Ayre ..	Desoutter Mk1	Hermes II.
J. C. V. K. Watson ..	J. C. V. K. Watson	"Hawk" ..	Cirrus III.
A. H. Youngman ..	Sqd. Ldr. A. Martingell	D.H. "Leopard" Moth	Gipsy Major.
R. O. Shuttleworth ..	R. O. Shuttleworth	Comper "Swift"	Pobjoy.
A. C. M. Jackaman ..	A. C. M. Jackaman	Monospar ..	2 Pobjoy.
F/O. Charles Allen ..	F/O. C. Allen ..	D.H. "Puss" Moth	Gipsy III.



The Second Civil Air Display

HIS ROYAL HIGHNESS THE PRINCE OF WALES showed his interest in civil aviation and his desire to help the work of the Guild of Air Pilots and Air Navigators of the British Empire by graciously attending the second annual Civil Air Display, organised by the Guild at Brooklands, on Saturday, May 20.

As befitted the occasion, the Prince arrived in his Vickers "Viastra" (two "Pegasus")—details of which may be found on page 488. He was received by Air Commodore the Rt. Hon. F. E. Guest, as Master of the Guild; the Rt. Hon. Sir Philip Sassoon (Under-Secretary of State for Air), who, in the unavoidable absence of the Marquess of Londonderry (Secretary of State for Air), had, at 3 p.m., opened the meeting; Dame Ethel Locke-King; the Duchess of Bedford; and Lt. Col. F. C. Shelmerdine (Director of Civil Aviation).

The first Display held last year was most unfortunate with the weather, and the heavy rain seriously interfered with the programme; this year, however, the brilliance of the sun added to the kaleidoscopic effect of the women's dresses, for the lawn outside the club-house was thronged with people and, socially at any rate, the meeting must have been an entire success. The cheaper public enclosures were also comfortably full, so it is to be hoped that the prime object of the Display—that of raising funds to augment the coffers of the Guild—was achieved.

Perhaps at this point a few words about the aims and objects of the Guild will not be out of place, for at least they will serve to explain why the aforementioned funds are so necessary.

The G.A.P.A.N., as it has come to be known, originated at a dinner of "veteran air navigators" held at Rule's Restaurant, Maiden Lane, London, on December 5, 1928. The late Sqd. Ldr. E. L. Johnston, navigator of the ill-fated *R.101*, was the organiser of the dinner, and his comparison of the position of air pilots to that of Master Mariners resulted in the formation of the Guild. Finally on October 1, 1929, the Deed of Constitution of the Guild was signed by the late Air Vice-Marshal, Sir Sefton Brancker, on October 19, at the Hotel Cecil. Subsequently Sir Sefton was installed as the first Master and Sqd. Ldr. Johnston as Deputy Master.

On October 4 of the following year came that terrible disaster to *R.101* which robbed the Guild of both these officers, and also of three other members.

Great as was this setback, however, it was not insuper-

H.R.H. the Prince of Wales at the second annual Civil Air Display, held at Brooklands on May 20. Immediately on his left, in a straw hat, is Dame Ethel Locke-King, the owner of Brooklands. (FLIGHT *Photo.*)

The Prince of Wales, greeted by Air Com. the Rt. Hon. F. E. Guest. Flt. Lt. E. H. Fielden, personal pilot to the Prince, is just alighting from the Vickers "Viastra" (two Bristol "Pegasus" engines) which is now in regular use by His Royal Highness.

Judging the Duchess of Bedford's winning "Puss Moth" ("Gipsy III") for the Concours d'Elegance. Left to right—Col. H. W. Outram, Mr. F. Handley Page, Flt. Lt. R. Allen (pilot to the Duchess), Mrs. Nigel Norman. (FLIGHT *Photo.*)

able, and under the Deputy Mastership of Air Com. F. E. Guest the Guild continued to grow. On December 12, 1932, Air Com. Guest was promoted to Master, and the Marquess of Clydesdale, now famous for the part he has played in the successful Houston-Mount Everest Expedition, was appointed Deputy Master.

The membership of the Guild, spread throughout the length and breadth of the British Empire, has now reached 270, and with this growth has come an increasing drain on the Guild's funds.

In 1932 Air Com. Guest instituted a scheme whereby a number of people were invited to become Honorary Wardens of the Guild, and to subscribe a set sum per annum for a period of three years. This scheme assured an income to the Guild until 1935, and last year the annual Civil Air Display was started with the idea, not only of augmenting this income for the time being, but also of establishing a fund which will, to a certain extent, enable the Guild to become less dependent upon the generosity of subscribers like these Honorary Wardens.

The objects of the Guild are naturally the safeguarding of the interests of those engaged as air pilots and air navigators; to promote improvements in the laws affecting commercial aviation; to elevate the technical and general knowledge of its members; and to maintain an Employment Bureau for the benefit of its members. The presence at this second Display of the Prince of Wales will do an enormous amount to help the Guild in its objects and hasten its establishment on a firm footing.

The Duchess of Bedford receiving the "Tatler" Cup, as first prize for the Concours d'Elegance, from the hands of Mrs. Shelmerdine. (FLIGHT *Photo.*)

Brooklands was chosen by the Guild for their Display, as it is one of the few aerodromes in the country having admirable facilities for controlling the "gate," and a display committee appointed by the Guild was entirely responsible for arranging the programme and for running the whole show. We mention this because many people seem to think that Brooklands Aviation or the Brooklands Aero Club, who are, of course, normally responsible for all flying at Brooklands, were getting something out of this Display, but, in point of fact, they had absolutely nothing to do with it either from an organising or financial point of view, the whole of the proceeds going to the Guild's fund. The fine weather attracted a large number of visitors. The club enclosure was more than comfortably full of the right type of people, while both the public enclosures held a very fair number of spectators. It is difficult on an occasion like this to see all the machines which arrive, but we did notice several quite interesting ones. One arrival, who came from Hooton, causing a certain amount of surprise and interest, was Mr. I. R. Parker on a rather ancient Blackburn "Dart," which it is rumoured he purchased for about the same as one would pay for a second-hand motor-cycle. We expect that the petrol companies will welcome Mr. Parker's purchase, as he told us that his fuel consumption from Hooton to Brooklands was just 63 gallons! It was a bad thing for him that what promised to him to be the most interesting event of the programme, namely, the Aerial Tortoise Race, was abandoned, as with this machine he should have stood a very good chance of winning. Quite a strong contingent came up from A.S.T. at Hamble, and we noticed a "Cutty Sark," two Avro "626's" and an Avro "V," all from that school, among the machines parked at the end of the aerodrome. Another machine which people crowded round was the latest Comper "Swift" ("Gipsy Major") which Flt. Lt. Comper is flying in the Deutsch de la Meurthe race in France on May 28. "Nick" will be the only British representative in the race and, judging on past performances, should stand a fair chance of lasting the course when some of his more serious rivals have "blown up." Besides the Blackburn "Dart" there was also a Blackburn "Nautilus," which seemed somewhat out of place at a civil air display, seeing that it is a torpedo bomber. More apposite was the arrival of one of Imperial Airways H.P. 42-seaters, but this did not land and only made a circuit of the aerodrome. The Sabena Company, however, sent over one of their Fokkers from Croydon, piloted by M. P. Cocquyt. The S.M.I. (see

The Club enclosure at Brooklands during the wait for the arrival of His Royal Highness the Prince of Wales on Saturday, May 20, when he visited the second Civil Air Display. (FLIGHT *Photo.*)

FLIGHT for May 11) was flown over from Hanworth and caused many favourable comments. The interception race proved that the new Miles "Hawk" ("Cirrus III") can outstrip the majority of its rivals in the matter of climb. For the purposes of this race Mr. Brie was stationed at an altitude of about 3,000 ft. in an "Autogiro," and the various machines in the race, starting on handicap, had to climb up to him; the first one to pass in front of him being adjudged the winner. Mr. C. Powis in the "Hawk" rapidly overtook the machines who had started ahead of him, and managed with one exception to outstrip those who started after him. He certainly gained by keeping an excellent course, but was obviously helped by the climb of the machine. It was only a few yards from the post, so to speak, that Mr. Lipton, of Birkett Air Service, Ltd., flying solo on a special "Moth" ("Gipsy III"), which was built for racing and until recently belonged to Mrs. Mollison, was able to slip in front of the "Hawk" and win the race. No doubt at that height the smaller load carried by the "Moth" had begun to tell quite seriously.

At the request of the Prince of Wales, the parachute event was put forward in the programme. Three demonstrators, Mr. Raymond Quilter using a G.Q. parachute, Mr. J. Tranum with an Irvin chute, and Mr. F. Marsland with a British Russell "Lobe," competed in an attempt to land in the circle. Mr. Marsland was the winner, being 185 yd. from the circle, Mr. Quilter second with 193 yd., and Mr. Tranum, who caused some amusement by missing the aircraft in the park by inches, was third with 265 yd. One of the chief events was a Concours d'Elegance. The judges for this event were Mrs. Nigel Norman, Col. H. W. Outram (Director of Aeronautical Inspection) and Mr. F. Handley Page. They had 17 machines to judge and, despite the excellence of all the machines, their verdict was received as the right one by all those who inspected the entries. Actually the winner won the same event last year. She was the Duchess of Bedford, and her "Puss Moth," G-ABOC, flown to the meeting by her pilot, Flt. Lt. R. Allen, was absolutely spotless, despite the fact that it had done considerably over 200 hours' flying, is over two years old, and has never been repainted. We were particularly impressed with the state of the engine, which appeared to have been treated to a very thorough "wash and brush up" every day of its life. It was not surprising therefore that this machine was given the first prize, thus winning the *Tatler* Cup. The Duchess of Bedford herself, piloting her own "Moth" ("Gipsy I"), G-ABXR, had flown solo to Brooklands, and was awarded a special prize for machines manned only by ladies. This was in just as good condition as the "Puss Moth," and must have run the other machine very close, for a place. Mr. M. Harley was second with his "Moth" ("Gipsy I"), G-ABYA. This is maintained for him by Phillips & Powis at Reading and certainly did them credit. The third was Mr. G. N. Stringer, who is Instructor at the Leicestershire Aero Club at Desford. His "Moth," G-AAZB, was perhaps not quite so striking as Mr. Harley's, but was very little less well kept, and there cannot have been very many marks between them.

Thereafter, at the conclusion of the Display, Mrs. Shelmerdine presented the Prizes, which included besides those for the various races and contests, gifts for all the pilots who took part in the Display.

A PERSONAL CELEBRATION

THOSE who make long-distance record flights or do other great things in the air always have to suffer the penalty of their success by absorbing a surfeit of food and drink at public functions given in their honour. Many of these functions are a bore; at some the food is bad, at some the speeches are bad, at some both speeches and food are bad, but at all of them the wretched heroes are ill at ease amidst a pompous and stiff-shirted accumulation of those who would bathe in the reflected glory of their guests' achievements.

However, such is life and pilots, particularly those in the R.A.F., try and suffer them with a good grace and as few words as possible.

There is one sort of recognition at feeding time of which no record-breaking pilot need fight shy, and that is a dinner held in his honour by the Junior Aero Club, at Ye Olde Hambone Clubbe, Ham Yard, Great Windmill Street, London, W.1 (the full address looks well, but is not really necessary).

At this club, where all the members specialise in being "matey" with those who have won recognition for a job of work well done, you don't wear stiff shirts—you probably wouldn't get in if you wore one—but their welcome is a very real one, which is backed up most satisfactorily by the kitchen (and the bar), where a smiling Chinese chef appears more than eager that you should enjoy yourself. In a word, you are at your ease whether you are a guest or member, and generally so pleased with yourself at the end of the evening that the Club gains another member before you leave.

Sqd. Ldr. Gayford established a precedent by going off with Flt. Lt. Nicholetts and making a world's record after he had been made a member. There is no reason why members shouldn't do that sort of thing, of course, but still it does deprive the Club of the satisfaction of roping in a new member at their dinners.

Maj. R. H. S. Mealing tore himself away from Gwydyr House for a while on Wednesday, May 16, and acted as Chairman when the Club showed Gayford and Nicholetts what it thought of them, and they seemed to like it.

Mr. C. H. Lowe-Wylde

THE funeral of Mr. C. H. Lowe-Wylde took place at Hither Green Cemetery on Wednesday, May 17. Col. the Master of Sempill and a large number of British flying and gliding clubs were represented.

Pterodactyl Retires to Kensington

THE Pterodactyl tailless monoplane, designed by Capt. G. T. R. Hill, is to become a permanent member of the South Kensington Science Museum, where it will join the august company of famous machines there present.

FROM THE CLUBS

THE RENFREW DISPLAY

Imbued with the spirit of their new dignity as managers of the Renfrew Airport, the Scottish Flying Club staged the sixth and most ambitious display during the week-end May 20 to 22. Indifferent weather on the Saturday gave way to perfect days on Sunday and Monday, which latter day was the King's Birthday holiday in Glasgow, and at the time of writing the financial success of the show seems assured.

Among visiting aircraft Scotland had a first view of Imperial Airways' monoplane *Arethusa*, the D.H. "Dragon," Avro 10 and Avro "Cadet," B.A.C. "Drone" and the "Cutty Sark." Other machines represented were "Gipsy Moths," H.P. *Helena*, Comper "Swift," "Autogiro," Airspeed "Ferry" and "Puss Moths." Over 30 aeroplanes in all took part in the display, which does not include Service machines.

The measure of R.A.F. support which was accorded the meeting on the Saturday consisted of nine machines ("Wapiti") of No. 602 (City of Glasgow) Bomber Squadron from the adjacent aerodrome of Abbots Inch. After a very beautiful performance by the Squadron, Glasgow people had the opportunity of receiving and hearing Sqd. Ldr. the Marquis of Clydesdale and Flt. Lt. McIntyre, who were presented with mementoes of their recent flight over Everest by their fellow members of the Scottish Flying Club.

Three Fairey "Flycatchers" from the R.A.F. base at Leuchars gave an impressive display of converging bombing and aerobatics in formation.

An ambitious programme of some twelve items was given twice each day, and throughout the daylight hours the imposing fleet of Scottish & Midland Ferries, Ltd., were kept busy with passenger flights both short and long. Imperial Airways also did good business with the 42-seater *Helena*—incidentally this machine flew non-stop from London to Glasgow on May 19 in 3¼ hr., or less than half the time taken by the fastest train—and flights round Loch Lomond in the *Arethusa* were very popular.

One hopes that the many visitors from the south were duly impressed by the smooth working and efficient organisation which the Display Committee of the Club have on this occasion brought to a fine art, and it would be invidious to mention any particular person when all were so obviously playing their part well.

LONDON AEROPLANE CLUB

A recently joined member of the Club is Lt. Col. Harrison, who did his first solo 20 years ago. Other new members are Messrs. J. Scherrer, L. Gedge, F. T. Matusch, F. Plutte, G. W. Harrison and A. Robertson, the latter from New Zealand. "A" licence tests were completed by Messrs. Hall and Maurice Braddell. M. L. Lipton won the Intercepter Race at Brooklands in the "Gipsy III Moth" he purchased from Mrs. Mollison. The London Aeroplane Club will miss the cheery face and inspiring music of Mr. Nigel Tangye, who is shortly leaving the Club to join the Aviation Dept. of the Automobile Association.

GRAVESEND AVIATION, LTD.

The School of Flying were disappointed by the de Havilland "Dragon" being weatherbound on Sunday, May 14, and unable to keep its appointment. Quite a large crowd of local celebrities had collected to see this machine demonstrated. However, the pilots of the school made up for the deficiency by giving a flying display of their own. The new "Fox Moth" was delivered on Thursday, May 18, and on Saturday, May 20, piloted by Flt. Lt. Smith, it was flying in the Display at Brooklands. Several bookings for the Continent have been received for this machine already. Instruction flying has increased steadily during the last three months, and flying in general is becoming more and more popular. Weekly dances are being arranged in the Club, which is becoming a popular local gathering place.

HANWORTH N.F.S.

Flying hours during the week totalled 94 hr., cross-country flights being done by Capt. Findlay and Mr. Fred Darling from Beckhampton to Gatwick and return. Mr. J. A. Borley (Hon. Sec. of the Club Committee) has successfully carried out his first solo for an "A" licence. On Monday, May 15, Lord Grimthorpe arrived from Yeadon, and on Thursday M. Georg Hanet, of Brussels, brought his "Puss Moth" to Hanworth, with M. de La Croix, of the Section Gantoise de Vol sans Moteur, who has just taken over the Belgian manufacturing rights of the B.A.C. "Drone," as passenger. On Saturday, May 20, Club machines carried out 19 hr. flying, Sqd. Ldr. de Haga Haig flying the "Drone" and the Hon. F. E. Guest a Club machine. Mr. John Tranum on Wednesday made a parachute drop from a Hawker "Hart," in preparation for his delayed drop. Some excellent photographs were taken by Empire Air Services, who are now in business at Hanworth. A B.A.C. "Drone," piloted by Capt. Ayre, is making a short tour of the provinces, demonstrations being given at Renfrew on May 21, 22, at Cramlington on May 23, at Yeadon on May 24, at Blackpool on May 25, at Woodford (Manchester) on May 26, and at Tollerton on May 27.

READING AERO CLUB

At the "At Home" next Saturday, May 27, there will be a landing competition, the winner being the first to land after 3 p.m.; the prize will be five guineas. The annual race for the "Northesk" challenge cup (ladies only) will be flown at approximately 4 p.m.; the entries include Lady Bailey, Mrs. Elise Battye and Miss Giles. It is hoped that Capt. Hope will demonstrate the "Tiger Moth," and there will also be flown the Miles "Hawk" and "Percival Gull." "Ground sports" will also be held, and it is hoped that any pilot who has not received an invitation will accept apologies and turn up.

MAIDSTONE AERO CLUB

Flying tuition is continuing its steady progress and another batch of pupils is nearly ready for "A" licence tests. The monthly "At Home" will be held on Sunday, June 4, and everybody is cordially invited to attend. On Saturday, June 17, an Air Display will be held in aid of local charities.

The Maidstone Aero Club are forming two detachments of the British Red Cross Air Section in support of the new scheme for the provision of a British Red Cross Air Section by the British Red Cross. The Club's detachments are open to anyone interested (member or non-member) and special reduced rates for flying will be given to those taking an interest in this section. Dr. J. H. Yolland, C.B.E., the Kent representative of the British Red Cross, has arranged to give free lectures to enable members to obtain their British Red Cross certificate.

BROOKLANDS

In the finer spells which brightened up the miserable weather during the week ending May 13, a good deal of flying was carried out. New recruits included Messrs. Frazer, Jackson, McKenzie and Everitt. Messrs. C. Hayter, C. Frost and Leete have done height tests for "A" licences, Mr. H. Waller will do his night-flying tests as soon as weather permits and Messrs. P. Stevens and J. Hazlehurst did first solos, the latter after a very short period of dual, for he had considerable experience during the war. Visitors included Maj. Miller, from South Africa, in his Junker monoplane W.13, also Miss Pauline Gower and Miss Dorothy Spicer in their three-seater "Spartan." Messrs. Th. Van Marken and S. S. Hordern have returned after a trip to Amsterdam in the "Tiger Moth," and the instructional staff took the opportunity to indulge in a few aerobatics. Another "Dawn Patrol" was undertaken on Sunday, May 14, in which nearly 40 machines took part, in spite of the bad weather.

CINQUE PORTS CLUB

The only first solo for the week ending May 13 was Mr. A. N. Duder; Mr. Harris was held up for his "A" licence tests by bad weather. In spite of the latter, however, 25 hr. were flown on Club machines that week. A promising feature of the Club's activities is the interest taken in flying by local business men. On May 9 Mr. O. V. Holmes flew Mr. Lukey to Dorset on a business trip and returned the same night. New members include Mr. Stephen Cliff and Mrs. Battye, while Mr. Coxen has started instruction. On Wednesday, May 31, Club members will be taking a holiday and a party will fly to Brooklands where a large red bus will be waiting to transport them to the Derby. Mr. and Mrs. W. E. Davis have recently acquired an old-world house named Berwick House, which is close to the aerodrome. The flying hours for last week were just under 40; Messrs. Duder and Hurndall got in successful first solos, and Mr. R. Butler is ready to follow suit. New members enrolled were Messrs. E. W. Boyle, J. W. W. Hurndall, M. Stewart,

S. V. Roland, W. C. Fisher and R. L. Quilliam ; they are all working hard for their "A" licences and keep Mr. K. K. Brown exceedingly busy.

On May 14 Maj. A. Miller and his party lunched at the Club before clearing Customs outward ; he was flying a new Junkers to South Africa for the Port Elizabeth Airways, Ltd. In the afternoon Mr. Christopher Clarkeson arrived with his wife and Capt. H. D. Davis in a "Dragon," escorted by Mr. Ian Barr in a "Tiger Moth." The machine was demonstrated to the Club members and some 50 guests comprised mainly of the Councillors and their wives from Folkestone and Hythe, including the Mayor (and Mayoress of Hythe) who is such an enthusiastic visitor on any such occasions. Great interest was shown in the demonstration and many were the hopes expressed that similar machines would shortly be operating in the vicinity.

On May 17 great interest was caused by the arrival of the Prince of Wales' new machine, which cleared Customs on its return from the Continent.

Mr. K. H. F. Waller has now completed his "B" licence tests and will shortly commence work as assistant instructor. With the number of pupils increasing at the present rate there should be plenty of work for him to do. It causes great gratification to be able to make this announcement, for last year it was difficult enough to keep one instructor really busy, let alone contemplate an assistant. Mr. Waller is very well known at the Club and his appointment is exceedingly popular with the members.

The Late Cinque Ports Flying Club

The final meeting of the original Cinque Ports Flying Club, Ltd., which went into voluntary liquidation, was held on May 10, and a first and final dividend was paid out of 17s. 8d. in the £. This was better than had been expected owing to the generosity of Sir Philip Sassoon, Bt., M.P., and Mr. M. S. Myers, who generously consented to waive all rights as shareholders in order that the smaller shareholders might benefit. The new Cinque Ports Flying Club is alive and flourishing under the management of Brooklands Aviation, Ltd.

CARDIFF AEROPLANE CLUB'S DISPLAY

The Cardiff Aeroplane Club will be holding their annual air pageant at Splott Aerodrome this year on Saturday, July 22.

NORTHAMPTON AERO CLUB

On April 29 the Club instructor, with Miss B. Pacey, Miss D. Tyzack, Messrs. P. Tyzack, J. Linnell, G. Linnell and K. Whitcombe, paid a visit to the Norwich Club, who were celebrating their move from the old quarters. It was an excellent show which everybody enjoyed, and it is hoped the Norwich Club will be comfortable in their new home. On the following Sunday Mr. S. A. Thorn and Capt. G. R. D. Shaw took off to search for the Bedford Divisional Signals Corps who were on manœuvres ; on finding these the machines let loose flour bags and several direct hits were claimed. There is every reason to believe that the display on Whit Monday, June 5, will be a great success, and a very interesting and varied programme has been arranged. Messrs. G. Linnell, P. Tyzack and Thorn have been very busy practising formation flying. On May 21 Lord Willoughby de Broke is giving tea on the aerodrome to members of the Northampton Chamber of Commerce and Rotary Club. A short flying display will be given and the de Havilland "Dragon" will be on view. The monthly club-house dance was well attended ; the next will take place on the evening of Whit Monday after the Pageant.

AIRCRAFT CLUB, HARROGATE

During Whitsuntide the Club will camp at the top of the old incline near Ingleby Greenhow, in the Cleveland Hills. Three small sailplanes can be housed, folded at the top. Hut accommodation is available, but blankets, plate, cup, knife, fork and spoon should be brought. Those who desire catering, and hay or straw on which to sleep, should advise the Hon. Sec. by Thursday morning, May 1 ; the charge will be about 3s. per day. For those who do not like the simple life there are good inns at Broughton and Ingleby Greenhow. Equipment can be consigned to: c/o Mr. Huby, Stationmaster, Battersby, L.N.E.R. Any owners of sailplanes will be welcomed, even though they may not be members of the Club. Mr. E. T. W. Addyman, the Hon. Sec., has made a few short flights in his "Zephyr" light wind sailplane, all of which were completed with his left hand, his right being incapacitated. He claims that he was absolutely at home on his first left-handed flight.

THE BRITISH GLIDING ASSOCIATION

In connection with the Huish Glider Meeting, in view of the fact that the first crop of grass is to be cut and gathered during the first fortnight in June, the owners of the land have suggested that it would be more convenient and advantageous to all concerned if the meeting commenced in the middle of June and not the beginning. This would not only provide more fields to land on, but less damage would be done to crops. Under the circumstances it has been decided to postpone the start of the meeting to June 15, the period now being June 15 to July 16 inclusive. Suitable facilities will be available for Clubs and others to carry out training. Passenger-carrying machines are being provided and the work of instruction will be carried out by a qualified instructor throughout the period. Where instruction is given by the B.G.A. Instructor, a fee of £1 5s. per pilot per week will be charged. It has already been pointed out that Huish Hill is excellent for soaring, so that "A" pilots will have no difficulty in getting their "B" licence, and "B" pilots will have no difficulty in getting their "C" licence.

LINCOLNSHIRE AERO CLUB

Owing to unforeseen circumstances it has been found necessary to postpone the official opening and pageant of the Lincolnshire Aero Club until Saturday, June 10. Among the items will be an arrival competition for machines landing between 11 and 12.45, the final of the race for the Lincolnshire Aero Trophy, the race for the *Grimsby News* Trophy, an altitude and landing race, obstacle race for visiting pilots, and parachute competitions. All visiting pilots will naturally be the guests of the Club at the official luncheon, the chair being taken by Brig. Gen. Hoare. Latest date for entries is June 5, except for the Lincolnshire Aero Trophy, entrances for which close on May 30.

THE DE HAVILLAND SCHOOL OF FLYING

THE flying time for the week ending May 13 was 120 hr. The R.A.F. Reserve Flying Club commenced its active career during the week. P/O. Brittain (son of Sir Harry Brittain) and P/O. Underwood had the first flight in their Club machine. Every credit is due to them for the way they have worked to organise this excellent scheme of providing an opportunity for flying at reasonable rates to Reserve Officers. A formation of a "Fox Moth," "Avian" and Avro "Cadet" from Air Service Training, Hamble, arrived for lunch on May 11. Lindsay Everard, M.P., arrived in his "Dragon" *Leicestershire Vixen*, and housed his machine for a few days. The Shackleton Murray Pusher Monoplane arrived from Sherburn Mallet on May 12. This was its first cross-country flight. The pilot amused everyone by applying brakes, accelerating the engine and forcing the machine on its nose to demonstrate that it cannot turn over. Mr. Alan Butler is having a refresher course in blind flying. Maj. Gen. Ping-Hung-Whang, late commanding the Chinese Army, inspected the School and machines on May 10. "Moth" machine G-ABCH was sold to a flying school in Rotterdam. Miss Kilsby successfully carried out her flying tests for the "A" licence. Mr. Streek has commenced a course of instruction.

The flying time for the past week was 159 hr. On May 19 a large gathering assembled to see Mr. John Tranum practising a delayed parachute drop from G-ABMR flown by Mr. Jerry Sayers, preparatory to his attempt to lower the world's record. To achieve this he will have to drop four miles and wait 1 min. 42 sec. before opening his parachute, during which time he will attain a speed of approximately 160 m.p.h. The R.A.F. Reserve Club have 90 keen, active members, who can avail themselves of the opportunity of flying at the rate of £1 per hr. The bookings are so numerous that an early expansion is indicated. Mr. Mussard, a private "Puss Moth" owner, who is a resident in Morocco, has commenced a blind-flying course. Mr. Harold Miskin flew to Littlestone and Huntingdon during the week-end in his "Moth" machine G-AAHO. The Stage and Screen Aero Club Secretary, Mr. James Raglan, flew the Club machine, and Mr. Ralph Richardson carried out his first solo after 9 hr. dual, which augurs well for his first performance in "Wild Decembers" at the Apollo Theatre on May 24. A very successful dance was held here on May 19. Mr. Cope provided much amusement by his conjuring, which was appreciated by all. A mannequin parade displaying Palm Beach suits and evening dresses was held on Saturday, May 20, and attracted a large assembly for tea on the terrace.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

May 25, 1933

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DECALAGE AND STRUCTURAL STRENGTH ASSUMPTIONS

By J. H. Crowe, M.Sc.

(*Concluded from page* 30)

In the terminal nose dive case, although $\overline{K}_L$ is not quite zero since wing load has to balance tail load at 90° angle of glide, it is quite legitimate to put $\overline{K}_L$ equal to 0 in order to determine the tail load since such a slight change in the mean lift coefficient will not affect the load.

Accordingly, putting $\overline{K}_L = 0$, we obtain for the moment about the C.G. at no lift the expression

$$K_M = \frac{\lambda \bar{a} \delta}{(\lambda + 1)^2} \tan \phi + \frac{K_{M_{o_U}} + K_{m_{o_L}}}{2} \quad . \quad . \quad (12)$$

Equation (12) shows the reduction in K_M and consequently in tail load with increase of ϕ and of δ. It shows also that there is no advantage in decalage from a point of view of reducing tail load if the stagger is zero as, of course, we should expect.

Since $\frac{\lambda}{(\lambda + 1)^2}$ is very nearly equal to 0·25 for all possible values of λ, and $\bar{a}$ may be taken for an average biplane as 0·038, equation (12) reduces approximately to

$$K_M = 0{\cdot}01\delta \tan \phi + \frac{K_{m_{o_U}} + K_{m_{o_L}}}{2} \quad . \quad . \quad (13)$$

Table I shows the percentage reduction in T.N.D. tail load with different degrees of stagger and decalage, assuming that the wings are of the same section, that is $K_{m_{o_U}} = K_{m_{o_L}}$. The blank spaces indicate that the whole of the tail load has disappeared or has been converted into a positive load.

The tail loads have been worked out for a concrete case over the whole range of speeds, making the following assumptions: Weight = 5,000 lb. $S_U = S_L = 250$ sq. ft. Tail plane area, $S^1 = 0{\cdot}15S = 75$ sq. ft. $\phi = 24°$ ($\lambda = 1{\cdot}22$). $x = 0{\cdot}3$. $\frac{g}{c} = 1$. Tail arm, $l = 2{\cdot}5c$. Parasite drag coefficient, $K_B = 0{\cdot}022$ (on glide). The wings are of aspect ratio 6 and are of R.A.F. 31 section, which has for K_m

$K_m = -0{\cdot}23\,K_L - 0{\cdot}029$ for the monoplane.

and $K_m = -0{\cdot}2\,K_L - 0{\cdot}029$ for the biplane.

Two cases have been considered $\delta = 0°$ and $\delta = 2°$. K_M has been found by means of equations (9) and (10) and the tail lift coefficient $K\gamma$ (such that tail load = $K\gamma\rho S^1 V^2$) is then given by

$$K\gamma = K_M \frac{S}{S^1} \frac{c}{l}$$

TABLE I

Per Cent. Reduction in T.N.D. Tail Load

$\phi°$	$\delta = 1°$			$\delta = 2°$			$\delta = 3°$		
K_{m_o} =	−0·01	−0·02	−0·03	−0·01	−0·02	−0·03	−0·01	−0·02	−0·03
8	13	7	4	26	13	9	39	20	13
16	27	14	9	54	27	18	81	40	27
24	42	21	14	84	42	28	—	63	42
32	60	30	20	—	60	40	—	90	60

and the velocity V by

$$V^2 = \frac{W}{\rho S \sqrt{\left(\overline{K}_L + \frac{S^1}{S} K\gamma\right)^2 + K_R^2}} \quad \text{where } K_R = K_D + K_B.$$

The curves for tail load, Fig. 3, show the increased positive load due to decalage and stagger. If only the T.N.D. conditions are being considered, the tail load may be conveniently found by means of equation (13) and then the mean K_L found by equating tail load to load on the wings. Then $\overline{K}_L$ can be split up into K_{L_U} and K_{L_L} by means of equations (8) and spar loads found. If the C.P.B. case is being considered, we know $\overline{K}_L$, hence obtaining K_{L_U} and K_{L_L} from equations (8) and inserting in equations (9) and (10) gives us K_M from which tail load may be found.

It is customary in the nose-diving case to take a loading ratio of 1 : 1 for normal aircraft. This is, of course, not strictly accurate, since if the two lift curves go through the same no lift angle as they should do the loading ratio should be the same as in the C.P.B. case. In finding spar loads in order to be consistent the loading ratio for the no decalage case has, therefore, been put as λ. It only has the effect of throwing 4 per cent. more load on the lower spar than on the upper spar for a stagger of 24°.

Considering any one plane, say the upper, let *ac* be the distance of the front spar from the leading edge, and *bc* the distance of the rear spar.

Then taking moments about the leading edge, remembering that a positive moment is clockwise, we have

$$K_{m_U} \rho S_U V^2 c = -F_U ac - R_U bc$$

Also, $F_U + R_U = K_{L_U} \rho S_U V^2$,

where F_U and R_U are the loads on the upper front and rear spars in lb. K_{m_U} is given by

$$K_{m_U} = -m K_{L_U} + K_{m_{o_U}}$$

These three equations lead to the results

$$\left.\begin{aligned} F_U &= \frac{\rho S_U V^2}{b-a}\left[\left(b-m\right) K_{L_U} + K_{m_{o_U}}\right] \\ R_U &= -\frac{\rho S_U V^2}{b-a}\left[\left(a-m\right) K_{L_U} + K_{m_{o_U}}\right] \end{aligned}\right\} \quad . \quad (14)$$

Similar expressions hold for F_L and R_L, these equations giving the spar loads over the whole range of incidence. It may be noted that since $(b - m)$ is greater than $(a - m)$ the front spar loads will vary much more than the rear spar loads with variations in K_{L_U} and K_{L_L}; that is to say, in decalage. Actually, in the typical machine already considered with 0° and 2° of decalage, the rear spar loads hardly vary at all, while it throws 73 per cent. more load on to the lower front spar. *a* and *b* have been given the values 0·15 and 0·65 respectively.

The curve of spar loads for small incidences is shown in Fig. 4, while Table 2 compares the loads in the terminal nose-dive attitude. These have been obtained as stated previously by equating tail load to load on the wings to find $\overline{K}_L$ and using equations (8) to find K_{L_U} and K_{L_L}. It will be seen that with the particular conditions assumed, nothing is really gained by the decalage machine, since what is taken off the upper spar goes on to the lower spar.

TABLE 2

Loads on Spars in a T.N.D.

Stagger = 24°

Spar.	$\delta = 0°$	$\delta = 2°$	Per Cent. Increase.
	lb.	lb.	
Upper Front ...	— 3,830	— 1,300	— 66
Lower Front ...	— 3,970	— 6,880	73
Upper Rear ...	4,800	5,030	5
Lower Rear ...	4,790	4,430	— 8
T.N.D. Tail Load	1,790	1,280	— 28

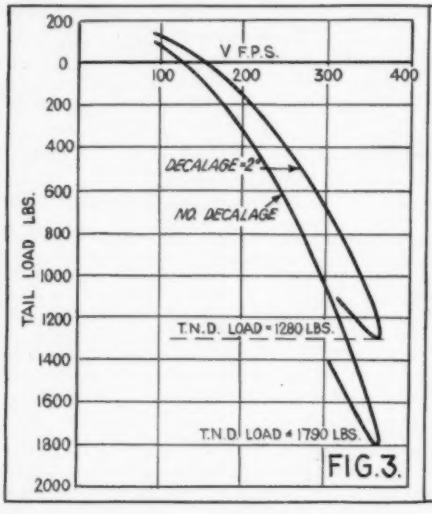


FIG. 3.

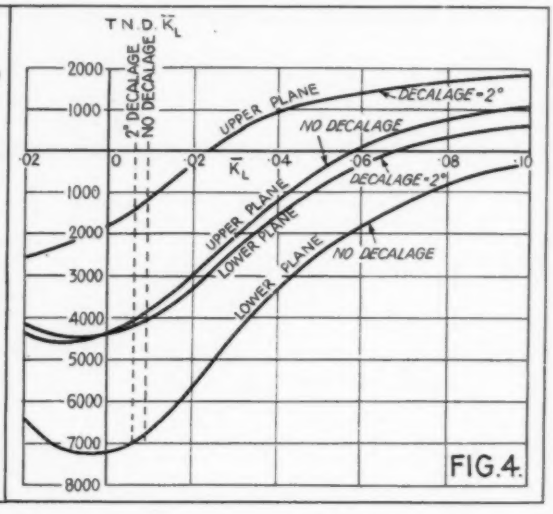


FIG. 4.

TABLE 3

Loads on Rear Spars C.P.B.

Stagger = 24°

Spar.	$\overline{K}_L = 0·1$		Per Cent. Increase.
	$\delta = 0°$	$\delta = 2°$	
Upper Rear ...	1,762	1,780	1
Lower Rear ...	1,713	1,553	— 9
	$\overline{K}_L = 0·2$		
Upper Rear ...	991	1,022	3
Lower Rear ...	942	886	— 6

There is, however, a distinct gain in the C.P.B. case as seen by Table 3. At $\overline{K}_L$ of 0·1, there is a decrease of 9 per cent. in the lower rear spar load, and only an increase of 1 per cent. in the load on the upper rear spar. As the $\overline{K}_L$ increases so these loads adjust themselves more to the no decalage case.

At $K_L = 0{\cdot}1$, the loading ratio $\frac{K_{L_U}}{K_{L_L}}$ is 2·81 for 2° decalage

as against 1·22 for the no decalage case. This has the effect of putting 35 per cent. more load on the upper plane, but there is only an increase of 1 per cent. in the load on the upper rear spar due to the fact that the C.P. moves from 0·464 in the first case to 0·396 in the second case. The corresponding C.P. positions of the lower plane are 0·522 and 0·757.

SOME NOTES ON DETAIL DESIGN

By W. S. HOLLYHOCK.

In the following article the writer has endeavoured to clarify certain aspects of detail design which do not appear to be fully appreciated by some of those whose business it is to evolve primary structure joints and fittings on aircraft.

As a starting point, one cannot perhaps do better than consider the, at one time, much discussed problem of an internally loaded member which subsequently has an external load applied to it. The best known example of this is the case of a flying wire which is tensioned up in the course of rigging and then has a flying load imposed on it in flight. For simplicity, the problem can be reduced to the case of an eyebolt which is tightened up on to some fitting and then has an external load applied to the eye end. At first sight it might seem that the two loads are additive but, in the case of the flying wire, it is assumed that no extra load is put into the wire until the external load exceeds the rigging load. In effect, the net load in the wire is always assumed to be the flying load.

That this assumption is justified, is proved by experience. Nevertheless, it is not strictly accurate unless the member which induces the rigging load—*i.e.*, the landing wire or its equivalent—is of the same length, cross-sectional area and material as the flying wire.

Since lift and landing wires are usually of comparable length and section and always of the same material, nothing untoward is likely to arise out of the assumption made.

Other cases, however, may arise in which no such assumption is justified and the elementary problem of the eyebolt may be used to exemplify some of these.

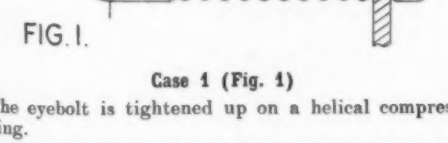


FIG. 1.

Case 1 (Fig. 1)

The eyebolt is tightened up on a helical compression spring.

Suppose an external tensile load, equal to the maximum that the bolt will normally stand, is applied at the eye, then the total extension of the shank will be an amount l_o, say (neglecting for the moment any extension due to the action of the spring). The spring will extend an amount l_2 equal to $l_o - l_1$, where l_1 is the amount of the initial extension of the bolt shank when tightened up. This extension, l_2, of the spring, being very small, will have practically no effect on the load exerted by the spring, and consequently the load in the bolt will be, to all intents and purposes, the sum of the initial and external loads—and the bolt will fail. Actually, since the loads are continuously additive, the bolt will fail when the external load equals the nominal failing load minus the initial load.

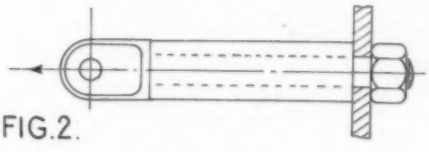


FIG. 2.

Case 2 (Fig. 2)

The eyebolt is tightened up on to a solid distance piece of metal of similar strength and elasticity characteristics. Assuming, for the sake of argument, that the sectional area of the bolt shank is half the sectional area of the distance piece, then the extension l_1 of the bolt under initial loading will be equal to $2\,l_2$ where l_2 is the (negative) extension of the distance piece—provided, of course, that they are both of the same material. In other words, the bolt is stressed twice as highly as the distance piece.

If l_o is the total extension of the bolt when loaded to its limit, what will happen upon the application of an external load sufficient in itself to extend the bolt an amount l_2 equal to l_o minus l_1? Obviously, if l_2 is greater than l_2—the initial compression of the distance piece—the distance piece will no longer exert any force on the bolt—since it cannot extend more than it has been compressed—and the total load on the bolt will be the external load. Consequently, it will not fail prematurely. The corollary is that if the bolt has been initially stressed so highly that l_2 is greater than l_2 (which might be called the reserve extension of the bolt), the load in the distance piece will never be completely removed and the bolt will fail under an external load less than its nominal maximum.

In order to arrive at some idea of the allowable magnitude of initial loading, it is possible to extract an expression for the maximum load to which a member may be subjected in terms of its nominal maximum load and the internal or initial load.

The eyebolt and distance piece may be used as a basis for calculation.

Let l_o = the total extension of bolt before failure,
l_1 = initial extension of bolt,
$l_2 = l_o - l_1$ = increase of extension of bolt due to application of external load,

and l_2 = extension (negative) of distance piece.

Let e = strain $= \frac{l}{L}$ where L = length (for the sake of obtaining a general formula, it is not assumed that lengths of bolt and distance piece are the same)

Then e_o, e_1, etc., will be the value of strain corresponding to extensions l_o, l_1, etc.

Let L_b, L_d, A_b, A_d, Y_b, and Y_d be the values of length, sectional area and modulus of elasticity for the bolt and distance piece respectively.

Let P_o = the nominal max. load the bolt will take,
P_1 = the initial load,
P_2 = the maximum load the bolt will actually take under these conditions

and $P_x = P_o = P_1$ = the load still imposed on the distance piece when bolt is extended to its limit.

Then $\frac{P_o L_o}{A_b l_o} = Y_b = \frac{P_1 L_o}{A_b l_1}$ and $\frac{P_1 L_d}{A_d l_3} = Y_d = \frac{P_x L_d}{A_d (l_3 - l_2)}$

$\therefore P_o = \frac{Y_b A_b l_o}{L_o}$, $P_1 = \frac{Y_b A_b l_1}{L_o} = \frac{Y_d A_d l_3}{L_d}$

and $P_x = \frac{Y_d A_d (l_3 - l_2)}{L_d}$

Also, $P_2 = P_o - P_x = P_o - \frac{Y_d A_d (l_3 - l_2)}{L_d}$

and $l_3 - l_2 = \frac{P_1 L_d}{A_d Y_d} - \frac{P_o L_o}{A_b Y_b} + \frac{P_1 L_o}{A_b Y_b}$

$= \frac{P_1 L_d}{A_d Y_d} + \frac{L_o}{A_b Y_b} (P_1 - P_o)$

$\therefore P_2 = P_o - \frac{Y_d A_d}{L_d}\left[\frac{P_1 L_d}{A_d Y_d} + \frac{L_o}{A_b Y_b} (P_1 - P_o)\right]$

$= P_o - P_1 - \frac{Y_d A_d L_o}{Y_b A_b L_d} (P_1 - P_o)$

$= P_o + P_o\left(\frac{Y_d A_d L_o}{Y_b A_b L_d}\right) - P_1\left(1 + \frac{Y_d A_d L_o}{Y_b A_b L_d}\right)$

Let $\frac{Y_d A_d L_o}{Y_b A_b L_d} = X$

Then $P_2 = P_o + P_o X - P_1 (1 + X)$.

therefore, if $P_1 (1 + X)$ is greater than $P_o X$, *i.e.*, if P_1 is greater than $P_o \frac{X}{1 + X}$, the initial load will never be completely removed and the bolt will fail at a load P_2, less than its nominal failing load P_o. This is the general formula which applies to any case.

In the case of the eyebolt, it may generally be assumed that $Y_b = Y_d$ and $L_o = L_d$. Also, the diameter of the bolt head (which usually decides the affected area of the distance piece) may be taken as being approximately twice that of the shank.

Consequently, $A_d = 3A_b$ and $X = 3$.

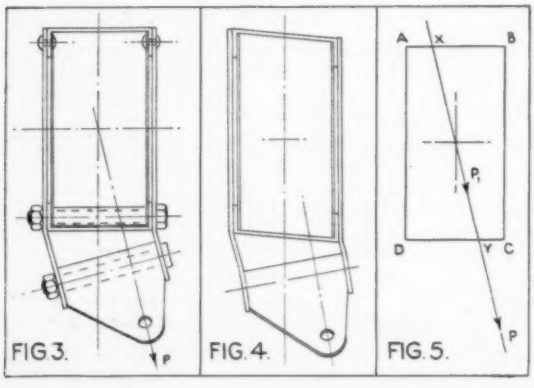
Therefore, if P_1 is greater than $\frac{3}{4} P_o$, the bolt will not reach its full load before failing.

The foregoing is perhaps of a somewhat academic nature, but it does serve to illustrate the possibilities in connection with initial loading and discloses a logical argument for the treatment of critical cases.

Joint Design.

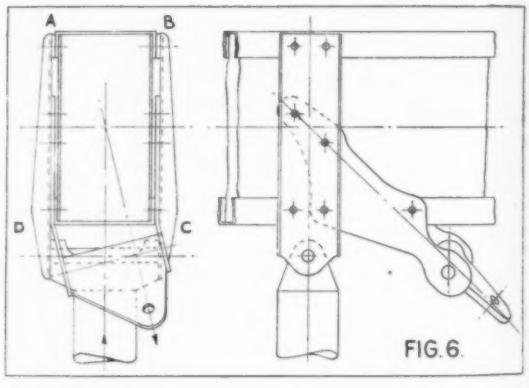
Turn now to another problem, that of joint design. It is frequently necessary to suffer offset loads—particularly in spar joint assemblies—and the path of the offset load within the joint may be a matter of considerable importance. Unfortunately, however, there is a great temptation to " hang " the load on to a couple of lugs and there leave it—to find its own way home.

Considering the joint depicted in Fig. 3, it will be seen that the lift-wire load P has been carefully arranged to pass through the centre of the spar section; but, owing to the stagger, a considerable offset exists at the points of attachment. Consequently, although there will be no tendency to twist the spar as a whole, there will be a very great tendency to distort it locally, as shown in Fig. 4. It becomes necessary, therefore, to introduce a diaphragm inside the spar to stabilise it. Also, the diaphragm must be sufficiently stiff in itself to transmit the load and adequately bolted or riveted to the spar. It is not sufficient to just put in a piece of metal and a few rivets and let it go at that.



Referring to Figs. 3 and 5, it will be seen that the loading in the joint in Fig. 3 can be reduced to the elementary load line diagram of Fig. 5. The rectangle ABCD represents the spar section and the line XY the line of action of that portion of the load P which travels through the section of the spar, *i.e.*, the load in the diaphragm. To give symmetrical loading on the section, the load P_1 at XY must equal half the total load P—the other half being taken directly by the bottom boom and the side-plate BC. The load P_1 will therefore impose compressive loading on the top boom and the side-plate AD through the medium of the diaphragm attachments. It follows, therefore, that these attachments can be accurately stressed. Incidentally, it may be noted that it is only necessary to attach the diaphragm at the side-plates—thus avoiding weakening of the spar booms—if the top of the diaphragm is flanged or otherwise adequately stiffened to take compression. The horizontal component of P_1 then passing across from A to B, but not actually in the spar boom.

There is one other point in connection with this type of case, namely, the attitude of the diaphragm in front view; it should, of course, be arranged to lie as nearly as possible in the same plane as the wire load.



An offshoot of the foregoing problem is the case of a joint arranged as shown in Fig. 6. In this case, the load from the strut returns down the wire. The lugs C and D taking the strut will naturally be designed to each take half the load coming on the strut, but unless the spar section is stabilised as already stated, the faces AD and BC will tend to move vertically in relation to each other as a result of the offset of the wire attachment. Consequently, the strut end will be unsymmetrically loaded and a bending moment applied to the strut. Also, the strut-end fitting at C will fail owing to the majority of the load coming on that side.

Consider now the front view of such joints. The joint shown in Fig. 7 is definitely causing the spar to be overloaded—unless it is desired to stress the lower spar boom more heavily than the upper one—which is most unlikely. Since there are seven bolts, if the side plates are stiff, the proportion of load on the top boom will be $\frac{3}{7}$ and on the bottom boom $\frac{4}{7}$ of the total. So that the bottom boom will be more heavily loaded than the top and a bending moment induced in the spar as a result.

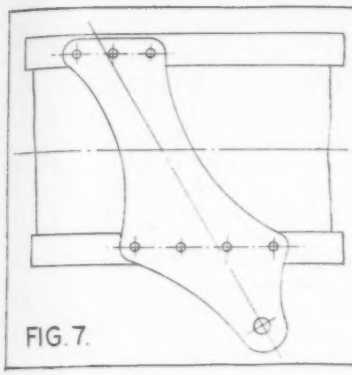


FIG. 7.

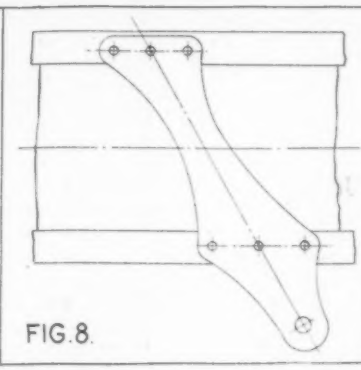


FIG. 8.

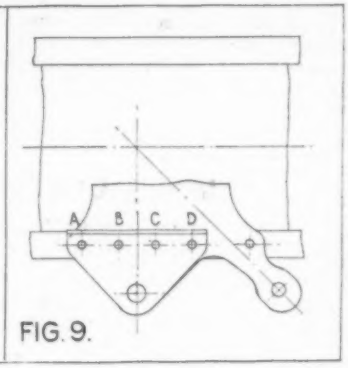


FIG. 9.

This joint is also bad, in that the bolts are not equally disposed about the centre-line of the load. Since the load will tend to distribute itself equally about its centre-line, it follows that the number and position of bolts and also the amount of metal in the side-plate in the region of the attachments, should be as nearly symmetrical about the centre-line as possible. The correct layout of this type of joint is shown in Fig. 8.

Another factor which needs consideration in connection with lugs bolted to spars and tubes is the possible unequal loading of the bolts. Referring to Fig. 9, the bolts at B and C being nearer the centre-line of the load will be more highly stressed than those at A and B unless the lug plate is particularly stiff in way of the bolts. If the bolts are all to do an equal share of work, the upper edge of the plate must be able to resist heavy compressive loading. It is necessary, therefore, to either flange it or make it very thick. Even flanging will not be sufficient unless the plate is reasonably thick, as distortion will occur between the bolts. Experience must be the guide in this case, as the stresses are not mathematically calculable.

There is one other point in connection with spar joints. Where a strut is attached to a spar, as in Fig. 6, the spar should have flanged plates or other stiff members between the top and bottom booms. Otherwise, there will again be an excess of stress in one boom. It is necessary to consider this point, as the ordinary spar webs are not usually stiff enough in themselves to take compression between the booms.

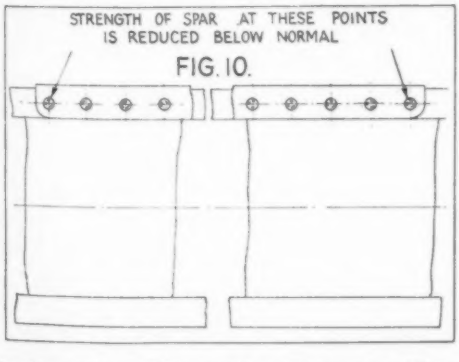


FIG. 10.

Another matter which merits consideration is that of reinforcings. If a spar boom is loaded in excess of its normal capacity, extra metal can be added in the form of a reinforcing patch as shown in Fig. 10. In determining the gauge of such a patch, allowance must be made for loss of metal at the rivet- or bolt-holes in both boom and patch—if the load is tensile or if the rivets are not of the same stress value as the boom, in the case of a compression load. Also, it must be remembered that at the extreme end rivets, the patch ceases to have any value whatever and the strength of the boom itself is reduced below its normal value by the rivet-holes. It follows, therefore, that the patch must extend well beyond its theoretically necessary length.

Another point which arises in connection with reinforcings is that of making up strength lost at bolt-holes. In such cases as that shown in Fig. 11, where a tube is to be reinforced, it is not sufficient to insert a short length of liner at the hole to increase resistance

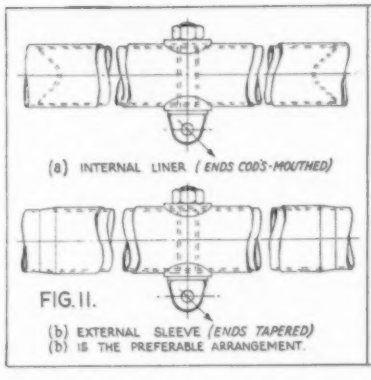


FIG. 11.
(b) EXTERNAL SLEEVE (ENDS TAPERED)
(b) IS THE PREFERABLE ARRANGEMENT.

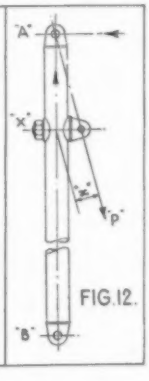


FIG. 12.

to bending. If the liner and the tube were a perfect fit, a reasonable length of liner would be necessary, but, as the fits of telescopic tubes are not by any means perfect, a really considerable length is required. To introduce a number of rivets or bolts only makes matters worse by reducing the strength of the main tube still further. These should, in fact, be omitted altogether unless there is a change in end load. In which case, it may be necessary to transfer some of the load to the main tube via the liner. Where, for example, the main tube is not thick enough to take, in bearing, the resultant end load imposed by the bolt or bolts—whose diameter may be restricted by other factors.

Incidentally, all liners or sleeves should be cod's-mouthed or tapered at the ends as shown in Fig. 11, to grade off the stiffness. Also, where possible, the reinforcing should be an external sleeve rather than a liner.

While on the subject of tubes, it may be as well to mention the case of a tube with another member attached as in Fig. 12.

Since the load lines all intersect at one point, there will be no bending moment on the tube AB as a whole, but a bending moment equal to P.x at X and falling off to zero at A will be imposed on the portion AX.

Finally, in connection with riveted work, it has been proved experimentally that isolated rivets do not develop their theoretical maximum shear stress, as the parts riveted together tend to pull away—thereby

putting the rivet in tension. Conversely, where a number of rivets are spaced comparatively closely, their strength is somewhat in excess of the nominal figure owing to the frictional grip between the parts attached by them.

TECHNICAL LITERATURE

"AERO ENGINES"

THE latest addition to Griffin's Aeronautical Series is Volume I of "Aero Engines," by John D. Frier, A.R.C.Sc., D.I.C., Wh.Ex., F.R.Ae.S., A.M.I.Mech.E., Head of the Mechanical Engineering Department of the Technical College, Coventry. The book is published at a reasonable price (10s. net), and will thus be available to a wide circle of readers.

It is the intention to publish "Aero Engines" in two volumes, and Vol. I deals with thermodynamics, combustion, cooling, and testing. Vol. II, which is to follow, will deal with practical considerations, and will include descriptions of all British aero engines.

The present volume deals with the usual elementary thermodynamics, and as Maj. F. M. Green points out in a foreword, Mr. Frier has repressed any wish he may have had to write about subjects which are of interest in thermodynamics, but which do not concern the practical student of the internal combustion engine. The subject of the carburettor engines comes next, and deals with the calculation of cylinder pressures and temperatures after the manner originally described by Tizard and Pye. Under compression-ignition engines the more important phases of injection and combustion are elucidated. The broad principles of cooling are outlined, and the importance of engine installation is stressed. The last part of the book deals with the calculation and measurement of indicated and brake horse-power, and with testing plants.

Mr. Frier gives numerous references, which indicate that the book is based very largely on papers read by various authorities before different societies, etc. This, of course, is natural and ensures that the book shall be as up to date as it is possible to make it. It is, however, noticeable that with one exception the references given are all to British works. We do not for one moment suggest that Mr. Frier is ignorant of the work done abroad, and his omission of references to it is probably due to the fact that his experience of teaching will have taught him the utter hopelessness of trying to persuade a student to read technical books in any language but the English. The one exception is the reference to Sadi Carnot's book of 1824!

One very mild criticism may be levelled at Mr. Frier's treatment of the two-stroke carburettor engine. This subject is dismissed rather briefly, and the only illustration is a section through a cylinder of Mr. Caunter's two-stroke engine. The general shortcomings of the two-stroke are not dealt with to any extent, and in view of the fact that serious attempts to introduce the two-stroke principle in aero engine work are being made, one feels that Mr. Frier might have given his readers a little more information on the subject. It is true that he does mention the difficulties in the way of providing the equivalent of crankcase compression for individual cylinders in a multi-cylinder engine, but Caunter's is not the only way of doing this, and in any case the drawing of the Caunter cylinder does not show how he does it.

Generally speaking, the book is well planned, and takes the student on step by step. Numerical cases are worked out, which is always a good feature of a book of this nature, and altogether Vol. I of "Aero Engines" can be recommended. It can be obtained from the offices of FLIGHT, the price being 10s. net., 10s. 6d. post free.

SUMMARIES OF N.A.C.A. TECHNICAL REPORTS

The National Advisory Committee for Aeronautics is the American equivalent of our Aeronautical Research Committee, with headquarters at Washington, D.C. The Technical Reports issued by the N.A.C.A. are obtainable from the Superintendent of Documents, Washington, D.C., U.S.A. In the summaries printed below the prices of Reports are given. These prices are net, and a small amount should be added to cover postage. For the guidance of potential purchasers it may be pointed out that the Reports rarely exceed 5 oz. in weight.

No. 423. WIND-TUNNEL RESEARCH COMPARING LATERAL CONTROL DEVICES, PARTICULARLY AT HIGH ANGLES OF ATTACK. III. ORDINARY AILERONS RIGGED UP 10 DEG. WHEN NEUTRAL. By Fred E. Weick and Carl J. Wenzinger. 10 cents.

Wind-tunnel tests have been made on three model wings having different sizes of ordinary ailerons rigged up 10° when neutral, the same models having previously been tested with ailerons rigged even with the wings in the usual manner. One of the wings had ailerons of medium size, 25 per cent. of the wing chord by 40 per cent. of the semispan, one had long, narrow ailerons, and one had short, wide ones. These tests are part of a general investigation on lateral control devices, with particular reference to the control at high angles of attack, in which all the devices are being subjected to the same series of tests in the 7 ft. by 10 ft. wind tunnel of the National Advisory Committee for Aeronautics. Force tests of the usual type, free-autorotation tests, and forced-rotation tests were made showing the effect of the ailerons on the general performance of the wing, on the lateral controllability, and on the lateral stability.

With the ailerons rigged up 10 deg. when neutral, negligibly small yawing moments (body axes), at all angles of attack which can be maintained by conventional airplanes, were given by the medium-sized ailerons with equal up-and-down deflection. Large favourable yawing moments, and no adverse ones with any portion of the total deflection, were given at all angles of attack by each of the three sizes of ailerons with up-only movement, by the short, wide ailerons with a medium differential movement, and by the medium-sized ailerons with an extreme differential movement. The direct rolling control was best at high angles of attack with the short, wide ailerons with an extreme differential movement, but this combination requires exceptionall high control forces. For neutral setting the lateral instability was found to be less with the ailerons rigged up 10 deg. than with them rigged even with the wing.

No. 424. WIND-TUNNEL RESEARCH COMPARING LATERAL CONTROL DEVICES, PARTICULARLY AT HIGH ANGLES OF ATTACK. IV. FLOATING TIP AILERONS ON RECTANGULAR WINGS. By Fred E. Weick and Thomas A. Harris. 10 cents.

This report is the fourth of a series on systematic tests conducted by the National Advisory Committee for Aeronautics, which compare lateral control devices with particular reference to their effectiveness at high angles of attack. The present report covers tests with floating tip ailerons on rectangular Clark Y wings. Ailerons of two profiles were tested—symmetrical and Clark Y, both with adjustable trailing-edge flaps. Each form was tested at three hinge-axis locations, both with and without vertical end plates between the ailerons and the wing proper. The results from these tests are compared with the results from tests on a wing of the same overall size equipped with average-sized ailerons.

All the wing-tip floating ailerons tested had about the same characteristics throughout except for their effect on the general performance of the wing. The general performance was found to be definitely poorer for all of the rectangular wings with floating tip ailerons than with a wing having the same overall dimensions and ordinary ailerons. At the stall and just above, the rolling control was less than an assumed satisfactory value, but was appreciably better than with the standard wing with ordinary ailerons. At angles of attack above 22 deg. the control with the wing-tip ailerons was found to be greater than the assumed satisfactory value, whereas the ordinary ailerons on the standard wing failed almost completely. The wings with floating tip ailerons gave no appreciable adverse yawing moments (body axis), but gave large favourable ones at high angles of attack. The instability in rolling was not as bad as for the wing with ordinary ailerons.

No. 439. WIND-TUNNEL RESEARCH COMPARING LATERAL CONTROL DEVICES, PARTICULARLY AT HIGH ANGLES OF ATTACK. V. SPOILERS AND AILERONS ON RECTANGULAR WINGS. By Fred E. Weick and Joseph A. Shortal. 10 cents.

This report covers the fifth of a series of systematic investigations in which lateral control devices are compared with particular reference to their effectiveness at high angles of attack. The present report deals with tests of spoilers and ordinary ailerons on rectangular, Clark Y wing models. In an effort to obtain satisfactory control throughout the entire angle-of-attack range that can be maintained in flight, various spoilers were tested in combination with two sizes of previously-tested ordinary ailerons—one of average proportions and the other short and wide. In addition, one large spoiler was tested alone.

It was found that when ailerons and spoilers are used together, the full effect of both is not obtained if the spoilers are located directly in front of the ailerons. With the proper combination of spoiler and aileron, however, it is possible to obtain satisfactory rolling control up to high angles of attack (15 deg. to 20 deg.), together with favourable yawing moments and small control forces. A moderate amount of rolling control with favourable yawing moments and small control forces was obtained with the large spoiler alone.

No. 444. WIND-TUNNEL RESEARCH COMPARING LATERAL CONTROL DEVICES, PARTICULARLY AT HIGH ANGLES OF ATTACK. VI. SKEWED AILERONS ON RECTANGULAR WINGS. By Fred E. Weick and Thomas A. Harris. 5 cents.

This report covers the sixth of a series of investigations in which various

lateral control devices are compared with particular reference to their effectiveness at high angles of attack. The present report deals with flap-type ailerons hinged about axes having an angle with respect to the leading and trailing edges of the wing. Tests were made on four different skewed ailerons, including two different angles of skew and two sizes of ailerons. At the high angles of attack, all the skewed ailerons tested were slightly inferior with respect to rolling and yawing moments to straight ailerons having the same span and average chord. Computations indicate that the skewed ailerons are also inferior with respect to hinge moments.

No. 450. THE CALCULATION OF TAKE-OFF RUN. By Walter S. Diehl. 5 cents.

A comparatively simple method of calculating length of take-off run is developed from the assumption of a linear variation in net accelerating force with air speed and it is shown that the error involved is negligible. The run formula is reduced to

$$S = \frac{K.V_s^2}{\frac{T_1}{W}}$$

Where V_s is the take-off speed, T_1 is the initial net accelerating force, W is the gross weight and K_s a coefficient depending only on the ratio of initial to final net accelerating force. Detailed instructions are given for application of the formula and for the calculation of all factors involved.

No. 453. THE ESTIMATION OF MAXIMUM LOAD CAPACITY OF SEAPLANES AND FLYING-BOATS. By Walter S. Diehl. 5 cents.

It is shown that the relation between the gross load W and the time for take-off t of seaplanes and flying boats is of the form

$$W_m = W + K\frac{b.h.p}{t}$$

Where W_m is the maximum possible load corresponding to infinite value of t $b.h.p.$ is the total brake horse-power and K is a constant. Data from four tests give K = 140.

This equation supplies a method of calculating time for take-off with any load, or *vice versa*, when the time or one load is known.

TECHNICAL NOTES

In addition to the printed Technical Reports, the N.A.C.A. also issues Roneoed reports known as Technical Notes. Unlike the printed reports, the Technical Notes are not available to the general public. Below we give brief summaries of a few recent Technical Notes dealing with the subject of lateral control.

T.N. No. 441. ROLLING, YAWING, AND HINGE MOMENTS PRODUCED BY RECTANGULAR AILERONS (CORRELATING TECHNICAL REPORTS NOS. 298, 343, AND 370). By R. H. Heald.

In this report the studies of the characteristics of rectangular ailerons described in references 1, 2, and 3 are summarized in the form of empirical equations which relate the aileron dimensions and displacements to the rolling, yawing, and hinge moments for pitch angles of 0 and 12 deg., corresponding to angles of attack of the wings of 4 and 16 deg., respectively. The report also includes a comparison of the results obtained by computation from measurements on a single aileron, with those obtained by using two ailerons mounted on opposite wings and displaced simultaneously. Satisfactory agreement is shown between these methods. Rectangular airfoils (10-in. chord by 60-in. span) having the Clark Y and U.S.A. 27 profiles and mounted on a model fuselage were used throughout the investigation.

The work was conducted in the 10-ft. wind tunnel of the Bureau of Standards with the co-operation of the Aeronautics Branch of the Department of Commerce and the National Advisory Committee for Aeronautics.

T.N. No. 443. WIND-TUNNEL RESEARCH COMPARING LATERAL CONTROL DEVICES, PARTICULARLY AT HIGH ANGLES OF ATTACK. VII. HANDLEY PAGE TIP AND FULL-SPAN SLOTS WITH AILERONS AND SPOILERS. By Fred E. Weick and Carl J. Wenzinger.

This report is the seventh in a series of systematic tests in which various lateral control devices are compared with particular reference to their effectiveness at high angles of attack. The present tests were made with ordinary ailerons and different sizes of spoilers on rectangular Clark Y wing models with Handley Page tip and full-span slots. The tests, which were made in the 7-ft. by 10-ft. wind tunnel of the National Advisory Committee for Aeronautics, showed the effect of the control devices on the general performance of the wings as well as on the lateral control and lateral stability characteristics.

It was found that the wing with Handley Page tip slots and certain combinations of the ailerons and properly located spoilers had satisfactory damping in roll and satisfactory rolling control with no adverse yawing moments at angles of attack up through 30 deg. With the full-span slot the conventional ailerons alone did not give rolling control of an assumed satisfactory amount at angles of attack above 10 deg. (maximum lift occurred at 26 deg.), but when combined with spoilers satisfactory rolling moments were obtained with no adverse yawing moments. Large spoilers tested as the sole means of lateral control on both the wing with tip slots and that with the full-span slot gave in both cases a moderate amount of rolling control at all angles of attack, together with favourable yawing moments which were extremely large, possibly too large.

T.N. No. 445. WIND-TUNNEL RESEARCH COMPARING LATERAL CONTROL DEVICES, PARTICULARLY AT HIGH ANGLES OF ATTACK. VIII. STRAIGHT AND SKEWED AILERONS ON WINGS WITH ROUNDED TIPS. By Fred E. Weick and Joseph A. Shortal.

This report is the eighth of a series of systematic tests in which various lateral control devices are compared with particular reference to their effectiveness at high angles of attack. The present tests were made with rounded tips: one rather blunt and only slightly rounded, and the other more slender with the curvature extending well in from the end of the wing. Medium-sized and short wide ailerons were tested on both wings, and in addition, skewed ailerons were tested on the wing having the more slender tip. The tests, which were made in the N.A.C.A. 7-ft. by 10-ft. wind tunnel, showed the effect of the ailerons and the tip shapes on the general performance of the wing, as well as on the lateral control and stability characteristics. The hinge moments were not measured but approximate values are given in the first report of the series.

It was found that the general performance of the wing with slightly rounded tips was somewhat poorer than that of a previously tested rectangular wing, but that the performance of the wing with tips having more extreme curvature was slightly better than that for a rectangular wing. Both of the aileron sizes tested on the wing with slightly rounded tips gave lower rolling moments at high angles of attack than the corresponding ailerons on rectangular wings. Reasonably satisfactory rolling moments at all angles of attack that can be maintained by average airplanes were given by all of the short wide ailerons tested with both tip shapes, and particularly by the short wide skewed ailerons on the wing having tips with extreme curvature. In general, the yawing moments were somewhat smaller for the ailerons on the wings with rounded tips than for the corresponding ailerons on rectangular wings.

T.N. No. 448. EFFECT OF AILERON DISPLACEMENT ON WING CHARACTERISTICS. By R. H. Heald.

The effect of aileron displacement on wing characteristics has been investigated for the Clark Y and U.S.A. 27 wing sections equipped with rectangular ailerons. The airfoils, rectangular in plan, and having a 10-in. chord and 60-in. span, were mounted on a model fuselage. Two sets of ailerons, both of 20-in. span, were used, the chord for one set being 2 in., for the other 3 in. Measurements were made for angles of pitch of 0 deg., 12 deg., 20 deg., and 40 deg.

When both ailerons were displaced equally in opposite directions (the conventional arrangement), the lift was reduced, the drag increased, and the centre of pressure moved forward. When one aileron was displaced downward, the lift was increased, the drag was increased, the centre of pressure remained in nearly the same position. When one aileron was displaced upward, the lift was decreased by an amount greater than that observed for the conventional arrangement, the drag was decreased for a large part, although not all, of the range of aileron displacement investigated, and the centre of pressure moved forwarp by an amount not greatly different from that observed for the conventional arrangement.

The one-aileron and two-aileron methods of determining the characteristics of the conventional arrangement were compared and the agreement found to be satisfactory.

The investigations were conducted in the Bureau of Standards 10-ft. wind tunnel in co-operation with the Aeronautics Branch of the Department of Commerce and with the National Advisory Committee for Aeronautics.

T.N. No. 449. WIND-TUNNEL RESEARCH COMPARING LATERAL CONTROL DEVICES, PARTICULARLY AT HIGH ANGLES OF ATTACK. IX. TAPERED WINGS WITH ORDINARY AILERONS. By Fred E. Weick and Carl J. Wenzinger.

This report is the ninth on a series of systematic tests in which various lateral-control devices are compared, with particular reference to their effectiveness at high angles of attack. The present tests were made with ordinary flap-type ailerons on two wings with different amounts of taper, one medium and the other extreme. On each wing both medium-sized tapered ailerons and short wide tapered ailerons were tested and, in addition, on the wing with the extreme taper, medium and short wide ailerons having a constant chord were tested.

The tests, which were made in the N.A.C.A. 7-ft. by 10-ft. wind tunnel, showed the effect of the different plan forms on the general performance and lateral stability characteristics of the wings, as well as the effect of the different aileron shapes on the lateral controliability. It was found that the rolling control given by the ailerons on the wing with medium taper was about the same below the stall as that for corresponding ailerons on rectangular wings, but above the stall the rolling control was somewhat lower than on rectangular wings and well below an assumed satisfactory value. At angles of attack below the stall the yawing moments caused by the ailerons were somewhat lower on the wing with medium taper than on a rectangular wing, but just above the stall the adverse yawing moments were greater. The ailerons on the wing with extreme taper gave better lateral control at angles of attack below the stall in regard to rolling, yawing, and hinge moments than corresponding ailerons on rectangular wings or on the wing with medium taper, but just above the stall the rolling moments fell off almost completely and adverse yawing moments of great magnitude occurred.

T.N. No. 451. WIND-TUNNEL RESEARCH COMPARING LATERAL CONTROL DEVICES, PARTICULARLY AT HIGH ANGLES OF ATTACK. X. VARIOUS CONTROL DEVICES ON A WING WITH A FIXED AUXILIARY AIRFOIL. By Fred E. Weick and Richard W. Noyes.

This is the tenth report on a series of systematic tests comparing lateral-control devices with particular reference to their effectiveness at high angles of attack. The present tests were made with two sizes of ordinary ailerons and different sizes of spoilers on a Clark Y wing model having a narrow auxiliary airfoil fixed ahead and above the leading edge, the chords of the main and auxiliary airfoils being parallel. In addition, the auxiliary airfoil itself was given angular deflection for the purpose of providing rolling moments for lateral control.

The tests were made in the N.A.C.A. 7-ft. by 10-ft. wind tunnel. They included both force and rotation tests to show the effect of the devices on the lift and drag characteristics of the wing and on the lateral stability characteristics, as well as on the lateral control. They showed that none of the aileron arrangements tried would give rolling control of an assumed satisfactory value at all angles of attack up to the stall except at the expense of abnormally high deflections and very heavy hinge moments. The most effective combination of ailerons and spoilers gave satisfactory values of rolling moment at all angles of attack below the stall, and the values did not fall off as rapidly above the stall as with ailerons alone. With an arrangement of this type having the proper relative proportions and linkage it should be possible to obtain reasonably satisfactory yawing moments and control forces. Deflecting one-half of the auxiliary airfoil downward for the purpose of control gave strong favourable yawing moments at all angles of attack, but gave very small rolling moments at low angles of attack.

T.N. No. 456. THE AERODYNAMIC EFFECT OF A RETRACTABLE LANDING GEAR. By Smith J. De France.

Tests were conducted in the N.A.C.A. full-scale wind tunnel at the request of the Army Air Corps to determine the effect of retractable landing-gear openings in the bottom surface of a wing upon the take-off characteristics of a Lockheed-Altair aeroplane. The tests were extended to include the determination of the lift and drag characteristics throughout the angle-of-attack range with the landing gear both retracted and extended.

Covering the wheel openings in the wing with sheet metal when the wheels were extended reduced the drag only 2 per cent. at a lift coefficient of 1·0, which was assumed for the take-off condition. Therefore, the wheel openings in the bottom side of the wing have a negligible effect upon the take-off of the aeroplane. Retracting the landing gear reduced the minimum drag of the complete aeroplane 50 per cent.

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any Bookseller.

THE BEHAVIOUR OF A SINGLE CRYSTAL OF ALUMINIUM SUBJECTED TO STRESSLESS CORROSION IN A STREAM OF TAP WATER FOLLOWED BY TEST TO DESTRUCTION, IN AIR, UNDER ALTERNATING TORSIONAL STRESSES (SPECIMEN No. AL.12B). By H. J. Gough, M.B.E., D.Sc., and G. Forrest, B.Sc. R. & M. No. 1476. (11 pages and 12 diagrams.) June, 1932. Price 1s. net.

Although a very considerable amount of information is now available regarding the fatigue strength of metals and alloys when tested under what have come to be termed "corrosion-fatigue" conditions, little attention has been paid to the changes in microstructure occurring under these conditions. In order to obtain some information on these points, a small series of tests consisting of a few carefully-chosen experiments is in progress at the present time at the National Physical Laboratory.

A single crystal of aluminium, enclosed in a water jacket, through which flowed a slow stream of tap water, was oscillated through a small angle at a frequency of 400 oscillations a minute and a total of 24×10^6 oscillations; the total corrosion time was 1,000 hours.

During the stressless corrosion stage, a general corrosion pitting attack resulted, which attack increased slowly in intensity as the test proceeded. By comparison with observations† of the same phenomena under corrosion-fatigue conditions, it is concluded that this general pitting attack is not influenced, to any marked degree, by the absence or presence in the metal of a state of elastic strain due to applied cyclic stresses. It is considered that stress, as such, has little influence, if any, in promoting corrosion during corrosion-fatigue action.

The subsequent test to destruction in air showed that the fatigue strength of the crystal had not been influenced, to any appreciable effect, by the corrosion occurring during the previous stressless-corrosion stage.

† *Proc. Roy. Soc.* A., Vol. 135, 1932.

THEORETICAL CURVES ILLUSTRATING THE PERIODIC FLOW BEHIND AN AIRSCREW. By C. N. H. Lock, M.A., and D. Yeatman. R. & M. No. 1483. (15 pages and 8 diagrams.) February, 1932. Price 1s. net.

In connection with the photographs of "filament lines" behind an airscrew, described by Townend in R. & M. 1434,* calculations have been made of the form of the filament lines for a simple case of potential flow in two dimensions. The case chosen was that of flow past the edges of a series of equally-spaced flat plates extending to an infinite distance in the direction away from their edges. This velocity field furnishes an approximation to the actual velocity field behind an airscrew, and the calculated filament lines show many of the features of the observed filament lines, such as the breaks which form a conspicuous feature of the observed lines when they cross the helical trailing vortex sheets left behind by the blades of the airscrew.

The calculations also illustrate the usefulness of the dotted "filament line" produced by Townend by the use of a series of electric sparks in place of the hot wire. They can be used to determine the instantaneous magnitude and direction of the velocity at any point in the field; this is illustrated by figures showing the effect of changing the phase relation between the instant at which the picture is taken and that at which the vortex sheet passes the hot wire.

It is suggested that measurements of the displacement of the spark dots might furnish values of the circulation round circuits cutting the trailing vortex sheets at various radii, which should be comparable with the circulation round the blades, determined by direct observations on the airscrew.

In a final section, the standard relation between thrust grading and difference of total pressure head across the airscrew disc, is established by a general argument applicable when the flow is periodic. The only theoretical argument previously available required the assumption of symmetry of flow around the axis of the airscrew.

* Hot wire and spark shadowgraphs of the air flow through an airscrew. H. C. H. Townend.

THE STABILITY ON THE WATER OF A SEAPLANE IN THE PLANING CONDITION. By W. G. A. Perring, R.N.C., and H. Glauert, F.R.S. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1493. (60 pages and 6 diagrams.) September, 1932. Price 3s. net.

The porpoising of a seaplane when travelling over the surface of the water is an important practical problem which has not hitherto been subjected to a close theoretical investigation. The design of a hull or float is usually based on the results of model tests in a tank, but these tests are open to the grave objections that they are frequently made on a bare hull without the appropriate aerodynamic structure of wings and tailplane, and that the models almost invariably are constructed with excessive mass and inertia. It is doubtful therefore whether these model tests can be used reliably to predict the behaviour of the actual seaplane.

The present investigation is an attempt to analyse the problem theoretically. The general equations for the disturbed motion of a seaplane in its plane of symmetry are written down, using fixed axes and ignoring any possible acceleration derivatives. These equations are then converted to a convenient non-dimensional form, and expressions are derived for the various force and moment derivatives. The determination of the aerodynamic derivatives presents no difficulty, but the experimental results available are inadequate to determine the necessary set of hydrodynamic derivatives. Approximate expressions have, therefore, been derived by assuming the planing surface to be a flat board of constant width.

The effect of longitudinal freedom is shown to have practically no effect on the stability, and hence porpoising may be regarded as an interaction of the vertical and pitching moments. Tests of a bare model without wings and tailplane are shown to be valueless and misleading, and a complete model should also have the correct ratio of mass to moment of inertia. In certain cases the influence of modifications to the seaplane has opposite effects, depending on whether one or two steps are in contact with the water. Wherever comparisons are possible, the results of the theoretical investigation agree with the recorded cases of porpoising observed during the tank testing of models, and also with the full-scale experimental results for the "Seagull." It is possible that some of the conclusions given in the report will be modified when experimentally determined derivatives are available to replace the rough values used in making the present calculations.

AIRFLOW ABOUT STALLED AND SPINNING AEROPLANES SHOWN BY CINEMATOGRAPHIC RECORDS OF THE MOVEMENTS OF WOOL-TUFTS. By B. Melvill Jones, A.F.C., M.A., and J. A. G. Haslam, M.C., D.F.C., B.A. R. & M. No. 1494. (12 pages and 32 diagrams.) August, 1932. Price 1s. 3d. net.

This report describes experiments in which cinematographic records were made of the movements of a large number of tufts of wool fastened to the fabric of the upper surfaces of the wings and tails of aeroplanes.

A previous report—R. & M. 1209‡—describes observations upon similar wool-tufts on the F.2b, but without cinematographic records. The method of fixing the wool-tufts was the same as described in that report, tufts being sewn at regular intervals upon strips of linen which were doped with their rows of tufts attached to the fabric of the planes.

The behaviour of the tufts gives a definite indication of the dividing line between the stalled and unstalled parts of the wing. On the unstalled part of the wing, where the main air stream is flowing directly over the wing surface, they lie parallel to one another, pointing steadily to the rear. Beyond a very slight tremor, no movement is observed. On the stalled part of the wing, where the main stream has left the wing surface, they behave in a variety of different ways which, however, fall into two principal groups; sometimes the motion of all the tufts appears to be entirely irregular, indicating a disorganised type of flow consisting presumably of a large number of small eddies moving about over the surface, so that each tuft gyrates about without much apparent relation to the movements of its neighbours; at other times all the tufts point forward and remain more or less still and parallel to one another, indicating the presence of a large eddy standing stationary above the part of the wing so affected with its axis roughly parallel to the leading edge. In this second condition the tufts are not so steady as when they are in the main stream, and it appears that the standing eddy is sometimes liable to be blown away for a short period and then to reform. All degrees of steadiness were observed, varying from a permanent eddy to one which formed only occasionally over a region where the flow was mainly irregular.

The records relate to the Atlas Mark I, in steady stalled glides, and in the spin, and to Bristol Fighter F.2b in stalled glides only. The Atlas had, on the upper planes, automatic wing-tip slots, which, in one series of experiments, were fixed shut, and in another were allowed to open. The wing sections of both planes of the Atlas are approximately similar to the section R.A.F. 28, but with all thicknesses increased by 7 per cent. The F.2b had wing-tip slots on both upper and lower planes; these were opened and closed by movements of the ailerons.

It is proposed to apply the method to the study of flow around the body and near wing roots, etc., also to attempt to develop methods of using smoke to show the form of the flow at some distance from the surface.

‡ R. & M. 1209. "Wool-tufts. A direct method of discriminating between steady and turbulent airflow over the wing surfaces of aircraft in flight applied to explore the region of effect of a slot on a Bristol Fighter wing."—Flt. Lt. Haslam.

ON THE ACCELERATION OF AN AEROPLANE UPON ENTERING A VERTICAL GUST. By L. W. Bryant and I. M. W. Jones. R. & M. No. 1496. (16 pages and 16 diagrams.) February, 1932. Price 1s. net.

With a view to the interpretation of accelerometer records in terms of gust velocities it was decided to investigate the effect of such factors as degree of stability, size and wing loading on the accelerations arising from vertical gusts.

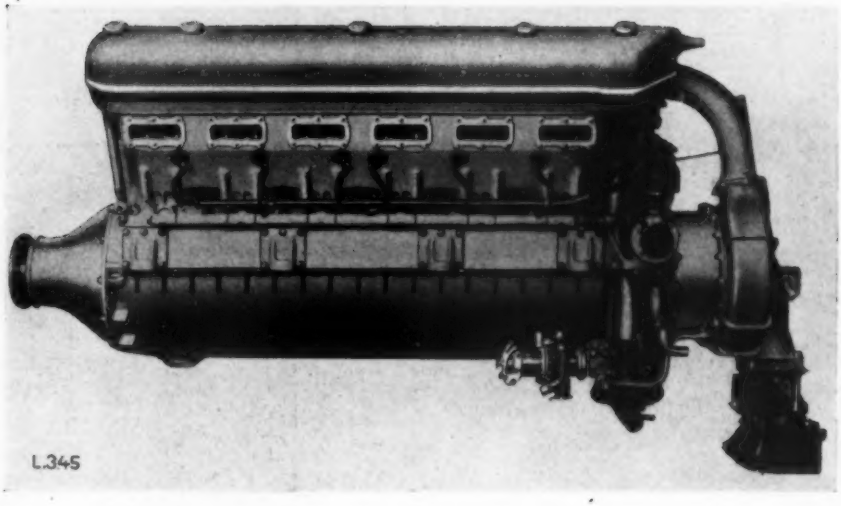
For a moderately stable aeroplane the hypothesis of a sharp edged gust gives a gust velocity within 10 per cent. of the truth provided the time or the corresponding distance travelled are less than certain amounts depending on the speed of the aeroplane and its length.

Increased wing loading decreases the acceleration due to a sharp gust. The longest aeroplane will be subject to the smallest loads in the sharpest gusts, but the effect of size is in general small, diminishes as stability increases, and is negligible for slow gusts.

The acceleration due to a gust which begins by increasing slowly and then rises very rapidly may exceed considerably that given by the sharp edged hypothesis for the same maximum gust velocity.

An unstable aeroplane gives very large maximum loads even for slowly increasing gusts.

The acceleration due to very sharp gusts appears to depend very much on the rate of growth of circulation around a wing subject to a sudden change of incidence. This question is to be investigated experimentally. The conclusions of this report may need modification as the result of this inquiry, and also on account of the influence of elasticity of the wings.



The Lorraine "Petrel"

New French Geared and Supercharged Engine

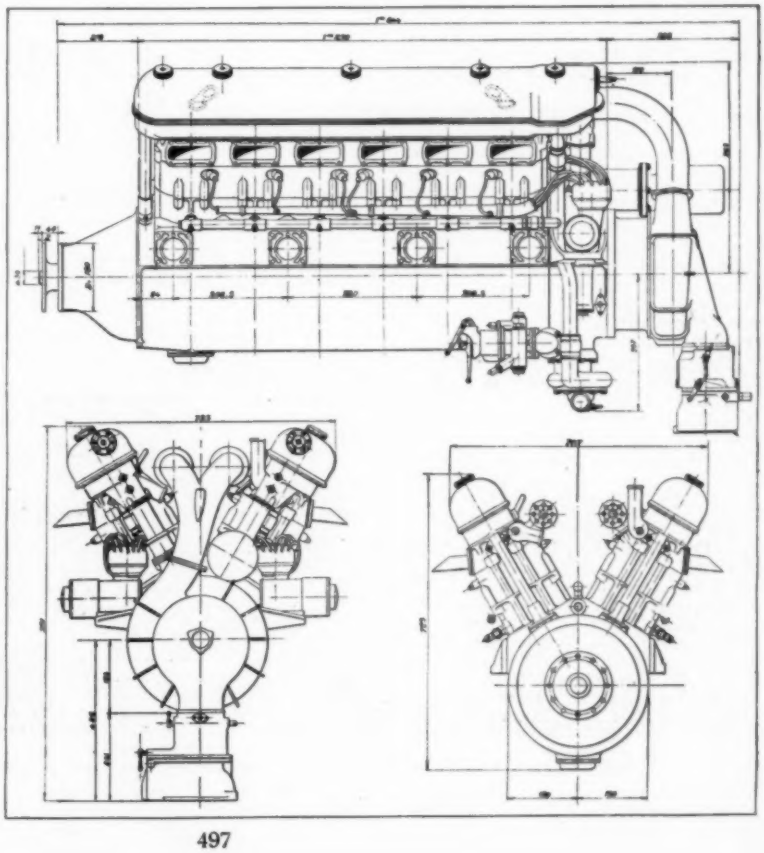
A FEW weeks ago the Lorraine works at Argenteuil got through the French types tests a new supercharged version of the Lorraine "Petrel" engine. Designed by the famous French designer Barbarou, the "Petrel" has been in existence for some time as a naturally-aspirated geared engine of 730 b.h.p. maximum. A supercharger has now been added, and the "Petrel" will in the near future take its place among the most modern aero engines.

The Lorraine "Petrel" is a 12-cylinder 60 deg. Vee water-cooled engine, with a bore of 145 mm. (5.7 in.) and a stroke of 145 mm. The engine is rated at 500/600 h.p., but develops 815 b.h.p. at 3,500 metres (11,500 ft.). The compression ratio is 6:1, and the petrol consumption is given as 217 grammes (0.477 lb.) per h.p. per hour. The weight of the engine dry (but including airscrew reduction gear) is 460 kg. (1,012 lb.). The airscrew reduction gear ratio is 11:17. The centrifugal blower is geared up in the ratio 8.4:1, so that at the maximum engine speed of 2,600 r.p.m. the rotor is running at 21,850 r.p.m.

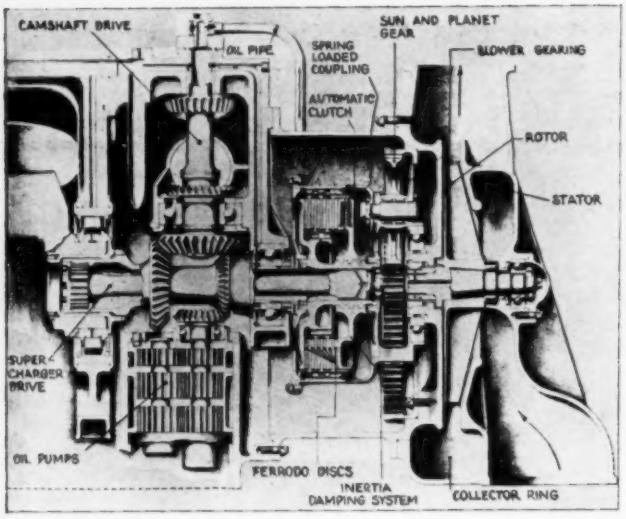
The light alloy crankcase is split horizontally, the upper half having cast on it the bosses for the cylinders, and carrying the crankshaft bearings, of which there are seven, five of which are plain bearings and the other two, in the centre and at the rear, are roller bearings. The cylinders are of hardened steel, screwed into the cylinder heads. The water jacket blocks are of light alloy. Each cylinder is provided with four valves, two inlet and two exhaust, operated by overhead camshafts. The tappets are T-shaped, and their stems form oil pumps for lubricating the cams.

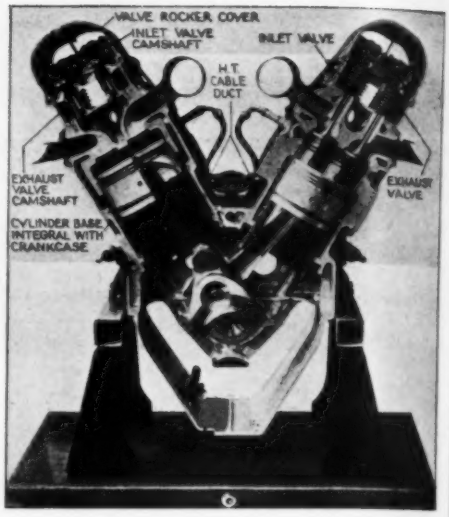
The pistons, of the short skirt type, are of special aluminium alloy, and have three compression rings and one scraper ring.

Two types of reduction gear are available for the Lorraine "Petrel," and the crankshaft is so arranged that either type can be fitted, or the engine can be used as a direct-drive type, although the high engine speed will



THE LORRAINE "PETREL" ENGINE: Outline installation diagrams.





THE LORRAINE " PETREL " : On the left a sectioned side view of the supercharger with its drive, etc. On the right a transverse section through the engine.

naturally make gearing advisable if good airscrew efficiency is to be obtained.

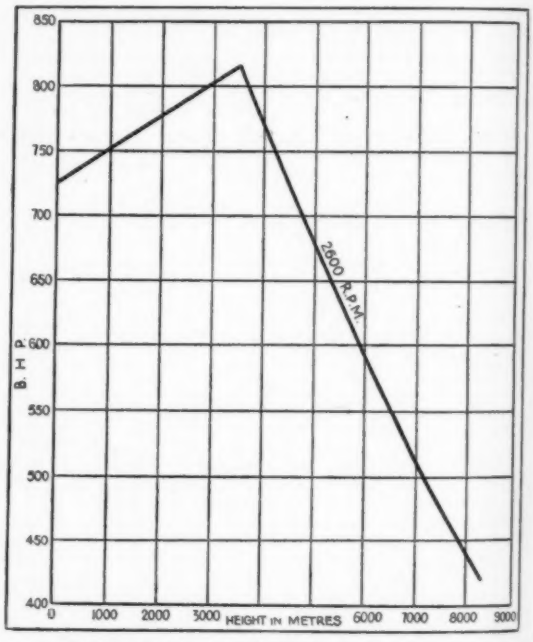
The concentric type of reduction gear is of the epicyclic sun-and-planet type, and has been used with great reliability in " Lorraine " engines for a number of years. This type of reduction gear is intended for general use in service or civil aircraft.

For particular use in single-seater fighters, the Lorraine firm makes another type of reduction gear. This is of the plain spur-gear type, with a smaller gear wheel on the crankshaft and a larger on the airscrew shaft. The latter is thus raised in relation to the engine and aeroplane, so that a lower undercarriage can be used while retaining the same ground clearance for the airscrew.

The supercharger is of the centrifugal blower type, the rotor being driven by sun-and-planet gears at 8.4 times the engine speed. To avoid the transmission of shocks when starting up, or when suddenly changing the speed of the engine, a series of friction discs are interposed between the drive shaft and the rotor shaft. Clamping of the discs is effected by a flange moving on a helicoidal slope. Some of the details can be seen in the sectioned view above.

A single carburettor is fitted on the intake side of the supercharger, so that the " Petrel " employs the British system rather than that which is now being developed in France, and which consists in placing the carburettor between the blower and the engine, the blower delivering air under pressure to the carburettor. In the " Petrel " the suction system is used.

Following prolonged tests during development, between which the engine was stripped and carefully examined, the " Petrel " has now passed official French tests, such as the acceptance tests in the general class, the homologation tests and finally tests for the special class of engines to be installed in fighter aircraft.



THE LORRAINE " PETREL " : Power curve.

Hooton's Loss

ON Wednesday, May 17, aviation suffered a sad loss by the death of Mr. G. H. Dawson. His death came suddenly after a short illness, although he had been in failing health for some considerable time. The death of his mother a fortnight ago was a great shock to him, which no doubt further affected the heart trouble to which he had been subject. Mr. Dawson, who was only about 60 years old, leaves a widow and five children, to whom we offer our sincerest sympathy. He was a well-known figure at Hooton, as together with Mr. Strain he administrated the Hooton Hall estate, upon which were both the Comper aircraft and Pobjoy engine factories. When the Comper Aircraft Co. was formed in 1929 he became its first chairman, and did much to help the company through its first and most difficult period. About a year ago, however, increasing pressure of work and failing health necessitated his retirement from this position. From the very first he was a power behind the Liverpool Aero Club and latterly acted as their Commercial Manager. His keenness on aviation was proverbial, and one of his dreams was the establishment of flying-boat services from Liverpool.

A Fast Power Boat Service

MR. SCOTT PAINE, whose 37-ft. R.A.F. Crash boats are already well known to our readers, has recently supplied a fleet of the same type of boat, adapted to commercial use, to the Isle of Wight Steam Packet Co. These boats will be used on a special express service between Southampton and Cowes. They will take 26 min. over the journey, or about half the time of the ordinary service.

AIR TRANSPORT

G.W.R. Air Service

THE Great Western Railway Co. have announced that in order to bring the fares charged on the Cardiff-South Devon Air Service more in line with the general reduction in rail fares owing to the introduction of the "Summer" Ticket, the following revised fares will operate as from May 15:—

	New Fares.				Old Fares.			
	Single.		Return.		Single.		Return.	
	s.	d.	s.	d.	s.	d.	s.	d.
Cardiff—Teignmouth, Torquay ..	40	0	72	0	60	0	100	0
Cardiff—Plymouth	45	0	80	0	70	0	120	0
Plymouth—Torquay, Teignmouth ..	12	6	25	0	25	0	40	0

The Postmaster-General has given his consent to mails being carried on the company's air service, but letters to be carried on this service must be handed in to one of the company's air booking offices for despatch. On arrival at destination letters will be reposted for delivery. An air mail fee stamp of 3d., shown in the accompanying illustration, will be affixed to each letter by the company.

The stamp used on letters carried by the G.W.R. Air Services.

On May 17 it was announced that the Cardiff-South Devon service would be extended on May 22 to Birmingham. This extension is a daily one, including Sundays, a machine leaving Castle Bromwich aerodrome, Birmingham, at 9.30 a.m., and calling at Cardiff and Haldon, reaching Roborough, Plymouth, at 12.20 p.m. The return journey starts from Plymouth at 4 p.m., Birmingham being reached at 6.50 p.m. It is of interest to note that the journey from Birmingham takes 5 hr. 20 min. by rail as compared with the 2 hr. 50 min. by air. The service will be operated by the three-engined Westland "Wessex" aeroplane, provided by Imperial Airways, as used on the Cardiff-South Devon service. The fares will be as follows:—Birmingham-Cardiff, 40s. single, 75s. return; Birmingham-Torquay, 50s. single, 90s. return; Birmingham-Plymouth, 60s. single, 110s. return.

The Birmingham Corporation, who are operating the road service between Snow Hill Station and Castle Bromwich aerodrome for the G.W.R., are providing free landing and housing facilities; and the Air Ministry have given special permission for the use of the Castle Bromwich aerodrome for the period of the service.

How America Does It

IT is announced that Pan-American Airways have placed with the Glenn L. Martin and Sikorski Companies orders for six flying boats, each to be capable of carrying 50 passengers at a cruising speed of more than 125 m.p.h. In addition to the passengers these flying boats are to be able to carry 6,000 lb. of cargo. The Martin M.130 and the Sikorski S.42 flying boats, which were illustrated in FLIGHT of January 19, 1933, are to have a practical cruising range, under all ordinary weather conditions, of at least 2,400 miles, which is considered sufficient to enable them to be used on such routes as the trans-Atlantic, via Newfoundland and Ireland and via Azores and Bermuda. The Pacific crossing via Hawaii. The total cost of these six flying boats will be approximately one and three-quarter million dollars. Mr. Trippe, president of Pan-American Airways, said that the building of the new boats was authorised now in the expectation that world trade conditions will have improved greatly by the time the machine can be delivered, and that then modern ocean types of aircraft will be required if the United States are to retain for American aviation its proper share of traffic on the ocean trade routes. Read in conjunction with the notes on Pan-American Airways' great push in China, published in FLIGHT last week, this statement is significant.

Flying-Boat Services to Isle of Man

BRITISH FLYING BOATS, LTD., which was formed last season and carried out several experimental flights on the West Coast of Scotland, proposes to provide an air service between the principal resorts on the Isle of Man and the mainlands of England, Scotland and Ireland. The service will be operated with the Saro "Cloud" amphibian flying-boat *Cloud of Iona*. The West Coast of Scotland will be catered for by another company working in co-operation with B.F.B.L. with a Saro "Cutty Sark" amphibian, while later in the year it is proposed to arrange a pleasure cruise round Scotland, possibly extending to the Orkney and Shetland Islands. The active directors of British Flying Boats, Ltd., are Col. the Master of Sempill, Mr. Richard Humble and Lord Malcolm Douglas Hamilton. Incidentally, it may be added that we understand that British Amphibious Air Lines, Ltd., of Blackpool, will again run a service this summer between Blackpool and the Isle of Man.

A London-Glasgow Service?

WE understand that Imperial Airways, Ltd., propose running a week-end service between Croydon and Renfrew. The first trip was carried out last week-end, in connection with the flying meeting at Renfrew.

Scottish Activities

HIGHLAND AIRWAYS, LTD., opened the Inverness-Orkney service on May 8, the first passengers being Sir Edmund Findlay, his mother, Hariet Lady Findlay, and

FOR THE ORKNEY AIR SERVICE: Highland Airways' "Monospar," which is operating the Inverness-Kirkwell air service, opened on May 8.

his brother, Mr. P. Findlay, Mr. D. S. Gabriel, of Inverness, and Mr. D. L. Smith, of Glasgow. Midland & Scottish Air Ferries, Ltd., of Renfrew, are preparing for a busy season, and apart from taxi and special charter services are planning services between Glasgow and Belfast, and the Western Isles and the mainland. The Scottish Motor Traction Co. are also active in the way of business flights, a recent flight being between Edinburgh and the Isle of Man.

London to Cowes in 110 Minutes

SPARTAN AIR LINES have now started their summer service bringing London within 1 hr. 50 min. of Cowes, in the Isle of Wight. Two trips will be made each way, daily, leaving Heston at 9.35 a.m. and 6 p.m. and Cowes 8.30 a.m. and 5 p.m. respectively. The journey between these aerodromes, which is made in great comfort in the new Spartan "Cruiser" (three "Gipsy Major" engines), takes but 50 min. The fare is 28s. single and 55s. return. The service will run on both weekdays and Sundays, but additional services will be put on as required. Imperial Airways act as the London agents for the service and the fares include transport from Airways Terminus, Victoria Station, to Heston Airport. The journey is an extremely pleasant one and passes over some of the best of our South Country scenery.

A New Soviet Air Route

IT is reported from Moscow that the first flight is to be made next month over the new Vladivostock-Petropavlovsk-Kamchatka air route, a distance of approximately 2,200 miles. Preparations for aerial facilities along the route are now complete.

SCOTTISH ACTIVITY: This D.H. "Dragon" of the Midland & Scottish Air Ferries was chartered on May 18 to transport several bales of wool from Kilmarnock to the Bairnsucar Knitting Co. at Nottingham, to be knitted for the Irvinebank Dye Works, Kilmarnock. The return trip to Kilmarnock was made the same day.

AIRPORT NEWS

CROYDON

DURING the past week there has been a slight all-round increase in the number of passengers and especially in the quantity of goods carried by the air line companies. On the Monday evening Mr. Eric Starling, a pupil from Gatwick, left Croydon at 10.45 p.m. on a night flight to Lympne. Nothing more was heard of him until 1.25 a.m. when the officer in the Control Tower received a telephone call and Mr. Starling was understood to say that he had mistaken some lights and consequently missed his course, finally landing in a street in Calais. He returned by a cross-Channel steamer the next day, bringing his aeroplane with him.

On Tuesday, May 16, Capt. Eden, Under-Secretary of State for Foreign Affairs, arrived by air from Paris, and left again for Paris the following day. Wednesday, May 17, Earl Howe travelled to Berlin and took part in a motor race on Sunday, winning the third prize.

The *General Field Marshal von Hindenburg*, formerly known as the D.2500, paid a visit to Croydon on Tuesday the 16th and returned to Berlin on the 17th. It is unlikely that the giant airliner will be seen again at Croydon for some months, as it has been withdrawn from the Berlin-London service to operate on the Berlin-Münich express, connecting with the service to and from Rome across the Alps. This is one of the busiest Continental air services.

Maj. Miller, Manager of the South African Airways, arrived from Berlin by D.L.H. on Friday the 19th. He returned to Berlin by the same machine on Saturday morning.

The first catapult machine to operate this season left the s.s. *Europa* and arrived at Southampton on Thursday, May 18, after a flight of over 800 miles, and left the same day for Amsterdam. Mails for all parts of Central Europe were brought to Croydon and despatched by the night air mail service. The catapult service, which is run in connection with the Nord Deutscher Lloyd, will continue until October.

Six officials of the German Air Ministry arrived from Berlin for a short visit on Saturday. Among them was Mr. Bolle, a famous air ace of war-time days. The German officials are attending a conference in London.

Rollason Aviation, Ltd., have decided to transfer their headquarters to Ford Aerodrome and they expect to vacate their premises at Croydon during the next few days. Air Taxis, Ltd., who have an office in the main booking hall at Croydon, started a joyriding business last Saturday with a "Hawk Moth," with which they carried out a number of pleasure flights.

We were glad to welcome to the Airport on Sunday Mr. Paddy Flinn, who, it will be remembered, crashed in the airliner *City of Washington*, better known as the G-EBIX, on October 30, 1930, when he suffered the loss of his left leg, five compound fractures in his right leg and a fractured spine. Despite the handicap of an artificial leg, Mr. Flinn carried out some very successful flying during the day. He is doing this with the object of regaining his "A" licence.

The total number of passengers for the week was 1,463; freight, 73 tons 13 cwt. "HORATIUS."

From Heston

MANY visitors landed at Heston Airport last week from abroad. Among foreign visitors were, from Holland, Mr. Smidt Crans in Mr. Van der Leer's "Puss Moth"; from Belgium, Mr. Hanse in his "Fox Moth"; Mr. Hanet in his "Puss Moth" and Mr. Mayiew in his "Moth." It is interesting to note that they are all flying British aircraft. On May 15 Air Commodore and Mrs. Fellowes, Flt. Lt. MacIntyre and F/O. Ellison landed on their return from India. On May 16 Mr. A. B. Gibbons and Col. the Master of Sempill cleared Customs on their way to take part in the first International Oesterreichischer Alpenflug. On May 21 Mr. Maurice Wilson left for Frieburg on his way to fly to Mount Everest. His plan is to land at 14,000 ft. and climb the remainder of the distance. His machine is a "Gipsy I Moth" G-ABJC, and has a petrol capacity of 59 gallons. The Airwork School has been very active all the week, nine new pupils having started instruction, and the School is pleased to welcome back many old pupils, among whom are Lady Howard de Walden, Lady Kathleen Rollo, Lady Haddington, Mrs. Rhodes-Moorhouse, Mrs. Williams, Lord Hindlip, Lord Borodale and Lord Hinchingbrooke.

New South Coast Airport

THE municipalities of Hastings and St. Leonards have decided to lay out an airport, and have applied to the Ministry of Health for permission to borrow £10,000 for the purchase of the necessary land. The site chosen lies halfway between Hastings and Bexhill, and it is hoped that part of the aerodrome will be completed this summer which may be used by light aeroplanes. The formation of a Hastings and St. Leonards Aeroplane Club is being discussed.

AIRISMS FROM THE FOUR WINDS

Italian Atlantic Flight

PREPARATIONS are in progress for the reception of the Italian Flight at Londonderry. Lord Londonderry, Secretary of State for Air, will fly to Ireland next month. A detachment of 25 mechanics of the Royal Air Force arrived in Londonderry on Friday, May 19, and Professor Eridia, of Rome, has also arrived there and is making arrangements to keep the airmen informed of weather conditions. Also two Italian trawlers, *Malaga* and *San Sebastian*, have arrived at Newfoundland to await news of the flight. The first stage of this, the most ambitious flight yet attempted, will be from Orbetello, in Tuscany, and the 24 Savoia-Marchetti flying boats, commanded by General Balbo, were due to leave on Wednesday, May 24. The machines will fly the Atlantic in formation by way of Iceland and Greenland to Labrador, Montreal being their destination, from where they will continue to Chicago. All members of the Flight are in special training and will wear on their uniforms a badge bearing the letter "A."

Lord Londonderry's Tour

THE MARQUESS OF LONDONDERRY, Secretary of State for Air, has just concluded a tour of R.A.F. stations, flying a Hawker "Hart" of No. 24 Communication Squadron. On Monday, May 15, he flew from C.F.S., Wittering, to No. 2 Armament Training Camp at North Coates Fitties in Lincolnshire, where No. 35 (Bomber) Squadron and No. 501 City of Bristol (Bomber) Squadron are carrying out annual training. Cranwell was next visited and the College inspected. On Wednesday, May 17, Lord Londonderry visited Donibristle, on the Firth of Forth, and inspected No. 100 (Bomber) Squadron. He then continued his tour to Leuchars, and Novar, in Ross-shire. Lord Londonderry was accompanied on the tour by Mr. L. G. S. Reynolds, his principal private secretary.

Prince George

PRINCE GEORGE flew from Windsor Great Park to Shoreham aerodrome, Worthing, to open the new Town Hall on May 22. He was piloted by Flt. Lt. E. H. Fielden, the Prince of Wales' pilot.

Anniversary of Lindberg's Flight

ON the sixth anniversary of the successful termination of Lindberg's Atlantic flight a stirring re-enactment of his landing took place at Paris on May 21. A French airman, in an aeroplane closely resembling that of Col. Lindberg's, landed on the aerodrome to the strains of the French and American National Anthems. Representatives of the French and American Governments were present.

The Akron Disaster

As a result of the Board of Inquiry on the loss of the *Akron*, a diversity of opinion has been disclosed. The Board attributes the cause of the disaster to a downward current of wind which forced the airship on to the water, adding that the commanding officer committed an error of judgment in not flying higher and attempting to avoid the storms. Admiral William V. Pratt, Chief of Naval Operations, however, contends that the report is inconsistent and that no reflection should be attached to the Commander. "Error of judgment" is probably a rather too strong expression; "lack of experience" would be more compatible with veracity.

Zurich—Paris by Glider

WILLEM FURNER last week made a successful flight in his glider, towed by a light plane, from Zurich to Paris. The 310 miles were accomplished in about five hours, and when over Le Bourget the glider was released and glided down into the aerodrome.

The Henly Rally

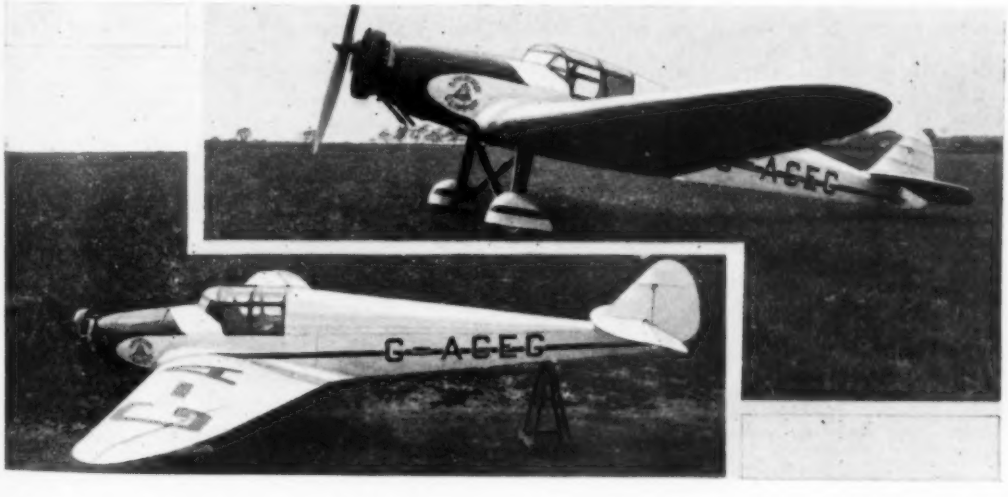
ON June 10, at Heston Airport, Henlys will be holding their annual rally when visitors will be entertained with an attractive programme of both motoring and flying events. One of the most spectacular of these will be a race by high-speed machines up to an "Autogiro" stationed at 2,500 ft. altitude, or as high as the weather permits. As always at these rallies, not only all private owners, but all other aircraft users, will be most welcome and everyone who would like further particulars of the arrangements should write to Henlys, Aviation Department, Heston Airport, Middlesex.

British Balloons Invade Switzerland

A BUNCH of toy balloons, with labels attached stating that they had been released in Middlesex, and were advertising a British film, have landed at Waedenswil, on the shores of Lake Zurich. It appears that the balloons maintained a cruising speed of 25 m.p.h.

Capt. Goering Flies to Rome

CAPT. GOERING, the Prussian Prime Minister, made a surprise visit to Rome on Friday, May 19. He arrived by air and was met by Gen. Balbo, the Italian Air Minister. The object of his visit is unknown, other than he is to continue negotiations concerning civil aviation, but he will be the guest of the Prince of Hesse.



THE SPARTAN "CLIPPER": This is a new and very interesting little two-seater cabin monoplane. Its Pobjoy engine gives it a very good performance, while the saving of structural weight achieved by the use of a Monospar wing allows a large pay load to be carried. There should be a great demand for a machine of this type when experiments with it are finished and it is placed into production. It is not expected on the market for some time yet.

HAWKER AIRCRAFT, LTD.

WITH a Share Capital of £800,000 divided into 400,000 Five per cent. Redeemable Cumulative Preference Shares of £1 each, and 1,600,000 Ordinary Shares of 5s. each, a new company under the above title was registered last week, the prospectus being issued for public subscription on May 23. The Company is taking over the business and assets of the H. G. Hawker Engineering Co., the very successful and well-known aircraft construction company. Applicants for Preference Shares have the option to apply for and have allotted for cash one Ordinary Share (at 10s. per share) in respect of each Preference Share allotted. Applications for Ordinary Shares alone will not be entertained. The continuance of the able control and management of the business is assured under agreement for 7 years with Mr. T. O. M. Sopwith (Chairman and Joint Managing Director), Mr. F. Sigrist (Joint Managing Director), Mr. F. S. Spriggs (General Manager), and Mr. F. I. Bennett (Chief Engineer). Thus there will be no break in the conduct of the work which has proved so profitable.

Net assets are shown at a total of £909,367, of which designs, licences, and patents are valued at £272,000 and goodwill at £100,000. The vendor is to receive as consideration for these assets £400,000 in cash, the proceeds of the present issue of 400,000 Ordinary shares, and an allotment of 1,200,000 Ordinary shares of 5s. each credited as fully paid. The vendor will thus receive, if the issue be fully subscribed, £600,000 in cash less the amount of the preliminary expenses—estimated at £28,000—together with shares of a nominal value of £300,000, but which on the price of 10s. each asked of the public, are officially considered to be worth £600,000. The amount attributable to goodwill, £100,000, will be written off out of the premium to be received on the issue of Ordinary shares. Profits of the vendor company are shown for a period of three years, the amounts being:—1930-31, £118,402; 1931-32, £143,306; and 1932-33, £151,612. The average figure is £137,773, which justifies the purchase price, for it covers the interest and redemption fund upon the Preference shares about four times, and leaves a sum equal to over 25 per cent. on the issued Ordinary capital.

Orders, the prospectus states, in hand are greater than those of the corresponding period in any of the last three years, whilst the directors separately and individually are under agreement to give to the Company the benefit of any inventions and designs made by them in any branch of aeronautics during the next seven years. The lists will close on (or before) Thursday, May 25, the registered address of the Company being: Canbury Park Road, Kingston-on-Thames.

We understand that the object of forming the company is to extend the activities both at home and abroad. The new company has no less than nine types of aircraft in service in the Royal Air Force, seven of which are in production and represent the latest equipment in their respective classes. The type of construction standardised by the Hawker company lends itself to facility of repairs, and to reconditioning without the need for highly-skilled personnel or expensive equipment. Hence the greater part of this work can be carried out by the personnel of the R.A.F., thereby affording facilities for training and instruction. Apart from machines supplied to the R.A.F. and the Fleet Air Arm, the Hawker company has extensive foreign connections, and in some cases machines are being manufactured abroad under license. The option to purchase manufacturing rights has been acquired by three foreign powers, and it is understood that further negotiations are in progress. The latest type of "Fury," to mention one among recent experimental types of Hawker aeroplanes, has been officially credited with 250 m.p.h.

THE B.A.C. "DRONE"

ARRANGEMENTS for continuing the manufacture of B.A.C. "Drones" have been made and Capt. E. D. Ayre, Manager of the workshops at Hanworth, will, for the present, be in charge. This news will be received with relief by all those who knew "Jimmy" Lowe-Wylde, whose sad death was recorded in our last issue, as he had his all in the business, and adequate provision for his wife and family depends upon continued production of the machine in which he had such faith, and which he gave his life to develop. That he actually did so would appear to be certain from evidence which came to light at the inquest. He had for a long time past refused to spare himself, even to going without sufficient sleep and food. This naturally told upon his health, and on the day of his death he had already complained of feeling faint while driving to the aerodrome. Apparently the machine suddenly went into a very steep dive, from a normal flying position at about 800 ft. high, which developed into a spiral dive out of which it never recovered. This would point to the occurrence of a fainting fit, and the Coroner's finding was to this effect.

There is, perhaps, some satisfaction to Lowe-Wylde's memory that his death was apparently not in any way due to a defect in his machine. This had recently been improved by fitting the latest type Douglas motor-cycle engine which has petrol pumps and an automatic carburetter. This has made possible lowering the petrol tank to the level of the engine mounting and making the machine much neater, besides doing away with the drag of the raised tank. Having an automatic carburetter greatly simplifies the controls, eliminating as it does the separate air lever. On this new model the addition of hand-controlled ignition makes for smooth slow running.

The first of this new type has now been delivered to British Hospitals Air Pageants. It has been painted to look like some fearsome caricature of the proverbial Chinese dragon by that well-known artist Mr. Heath Robinson, and will certainly amuse the crowd when flown during the displays being given all over the country. We ourselves took the opportunity recently to "waffle" round on this machine for some time, and can say at once that flying it was lots of fun and sheer pleasure. We would like to see a little more attention paid to silencing it, as that would be a great improvement not only for the pilot, but also from the point of view of those on the ground. Apart from that, however, and the fact that there would seem to be room for improvement in the flying controls, there is very little one can criticise in the machine when one takes into account what it is meant for, who it is meant for, and its cost. It is one of the few machines which undoubtedly offers clubs a means of providing flying for their members, at a profit to themselves. Machines like these are just the type which the average club member wants. By far the greater proportion of all club flying is done by members who go down during the fine weather to fly round the aerodrome for a short while. They do not want an aircraft which they can push through bad weather from A to B, with impunity, at high speed. They nearly all want something which is not large and expensive, which is not frightening to people when they begin to learn to fly, and above all something which does not have to be "flown" all the time. Something in which they can go slowly and have a look round, and the "Drone" shows the way to the achievement of this. Half an hour on a quiet summer's evening on the "Drone" would be a mental tonic, and we feel sure that it will have a wide appeal to flying clubs for just this purpose. It will also be great fun with this little machine to explore sources of rising air currents like hillsides, cumulus clouds and ploughed fields in the sun, while for examining ruins, old country houses, Roman roads and other matters beloved of the antiquarian and archæologist, it would be admirable.

Statue to Amundsen

ON the celebration of the one hundred and nineteenth anniversary of the Norwegian Constitution, on Wednesday, May 17, a statue to Amundsen was unveiled at Tonsberg.

TRIUMPHANT OVER ALL DIFFICULTIES

SPEAKING at a luncheon given at Park Lane Hotel on May 18, in honour of Sqd. Ldr. O. R. Gayford and Flt. Lt. G. E. Nicholetts, holders of the World's Long-Distance Record, MR. C. R. FAIREY, President of the Royal Aeronautical Society, brought out for the first time many of the great difficulties which faced the pilots in making their record-breaking flight.

He pointed out that every advance of science brought with it a disproportionately large increase of strain on the human element. Records, in fact, were made more by men than by machines. Referring to the route, Mr. Fairey said this obviously had to be an Imperial one, but unfortunately the British Empire did not provide long distances over which steady, unidirectional winds were to be found. The route to South Africa was not like that from America which was characterised by a steady westerly gale. It also necessitated going from mid-winter to mid-summer and over one of the worst storm areas in the world. Only one aerodrome in England was large enough for the take-off, and the funds available did not allow of more than one narrow concrete runway being laid down. It was therefore necessary to wait for just the right direction of wind before the take-off could be made safely. Moreover, that time had to coincide with the right weather conditions, as far as possible, over the whole route. These and many more similar points had not been sufficiently brought out, he maintained, and the uninformed public had thereby not been able to differentiate between this magnificent flight and those which were a succession of hops by light aircraft.

The aircraft itself also imposed difficult conditions on the pilots. Fully loaded, it only had a climb of 1½ deg., which meant that it could only reach a height of 60 ft. at the end of half a mile. It only lost weight at the rate of 200 lb. per hr., and yet it had to be got up sufficiently high to avoid the Atlas Mountains. The carburetter had to be adjusted correctly every quarter of an hour, otherwise the range would have dwindled away to a mere 4,000 miles. Yet despite all these trials the two officers stepped from the machine at the end of their ordeal, washed, shaved, and dressed as befitted R.A.F. officers arriving for the completion of an official flight to South Africa.

Mr. Fairey also paid tribute to the way in which Flt. Lt. Nicholetts stepped into the job, with only a few weeks' notice, after the tragic death of the late Flt. Lt. Betts. Finally, he drew attention to the wonderful work of the civilian staff of the Air Ministry, from Farnborough, and the Meteorological Department, without whom the flight would have been impossible.

In conclusion, he announced that the two officers had, very fittingly, been made, together with Flt. Lt. C. F. Uwins, the first recipients of the new British Silver Medal for Aeronautics which has been founded by the Royal Aeronautical Society.

LORD GORELL, Chairman of the Royal Aero Club, seconded the toast proposed by Mr. Fairey, and presented the two pilots with the official certificates of their record.

SIR PHILIP SASSOON, Under-Secretary of State for Air, responding on behalf of the Royal Air Force, thanked Mr. Fairey and Lord Gorell for all the kind things which they had said about the R.A.F., and also the Royal Aeronautical Society, the Royal Aero Club, the Society of British Aircraft Constructors, Ltd., and the Air League of the British Empire for organising the luncheon. He said that while he was sure that in the R.A.F. there were hundreds who would have done the same as these two officers, yet the fact remained that they were chosen. They must, therefore, to use a popular slogan, possess all the qualities of the others, " plus a little something some others haven't got." The R.A.F., he felt, bred men who had that " something," and it could be likened unto a bright shield held between us and our foes, for more and more was it certain that the safety of these Islands depended upon the efficiency of the R.A.F. and the skill of its personnel.

SQD. LDR. GAYFORD was grateful for the honour done to the R.A.F. by the luncheon. He said they were lucky to be chosen from among the two or three thousand pilots who could have equally well performed the flight. He stressed the fact that they were dependent on the technical staff of the Air Ministry, the R.A.E. at Farnborough, the Meteorological Office and the industry.

He described some incidents of the flight, and said that, generally speaking, they only got what was expected. In fact, conditions might well have been worse. Walvis Bay had always been the place they hoped to make, he pointed out, and during their long period of waiting they had consistently applied the aircraft's performance to the weather conditions which occurred and the average had always been Walvis Bay.

FLT. LT. NICHOLETTS felt that, after all Sqd. Ldr. Gayford had said, there was little he could add, except to draw attention, once more, to the wonderful way in which they were helped by all the personnel connected with the flight.

MAJ. GEN. J. E. SEELY, Chairman of the Air League, proposed the toast of " The Chairman," which was received with acclamation. Among those present were:—

Dr. Auranawski, A. J. A. Wallace Barr, R. Blackburn, Sir Harry E Brittain, Maj. G. P. Bulman, H. Burroughes, Air Comm. J. A. Chamier (Secretary-General of the Air League of the British Empire), Air Marshal H. C. T. Dowding (Air Member for Supply and Research), Lord Gorell (Chairman of the Royal Aero Club), B. E. Holloway (Director of Contracts, Air Ministry), J. Lord, F. Handley Page, G. Parnall, Capt. H. C. Rawlings, R.N. (Director of the Naval Air Division, Admiralty), F. Rowarth, Marshal of the Royal Air Force Sir John M. Salmond, The Rt. Hon. Sir Philip Sassoon (Under Secretary of State for Air), Maj. Gen. The Rt. Hon. J. E. B. Seely (Chairman of the Air League of the British Empire), Lt.-Col. F. C. Shelmerdine (Director of Civil Aviation), H. O. Short, Sir John D. Siddeley, Sir Harold E. Snagge, Flt. Lt. G. Stainforth, H. J. Thomas (Chairman of the Society of British Aircraft Constructors), Capt. C. F. Uwins, Sir Alliott Verdon-Roe, Lord Wakefield, C. C. Walker, G. E. Woods-Humphery.

HONOURING R.A.F. LONG-DISTANCE FLYERS: At the Luncheon given on May 18 to Sqd. Ldr. Gayford and Flt. Lt. Nicholetts. Left to right, Sqd. Ldr. Gayford, Mr. C. R. Fairey, Flt. Lt. Nicholetts and Lord Gorell, Chairman of the Royal Aero Club.

Luncheon to Lord Clydesdale

THE Duchess of Hamilton and Brandon gave a luncheon party on Wednesday, May 17, at the Dorchester Hotel in honour of her son, the Marquess of Clydesdale.

Gordon Boys' Home

H.R.H. THE DUKE OF YORK will inspect the Gordon Boys' Home on Friday, June 9, at 2.45 p.m. All old boys are cordially invited to attend.

THE PRINCE PRESENTS THE ESHER TROPHY

THE PRINCE OF WALES visited Hendon on Tuesday, May 16, to present the Lord Esher Trophy to No. 604 County of Middlesex Bomber Squadron. His Royal Highness arrived by air from Cardiff at 7 p.m. in his new Vickers "Viastra," piloted by Flt. Lt. E. H. Fielden. He was accompanied by his equerry, Maj. J. R. Aird, and was welcomed on arrival by Marshal of the Royal Air Force Sir John Salmond, Sir Philip Sassoon, Under-Secretary of State for Air, Sir Samuel Hoare, Hon. Air Com. of No. 604 Squadron, Air Vice-Marshal Sir Robert Brooke-Popham, Air Com. W. F. MacNeece Foster and other officers of the Royal Air Force. In presenting the trophy to Wing Com. A. S. W. Dore, Officer Commanding No. 604 Squadron, the Prince of Wales said that he wished to offer his sympathies to all the squadrons stationed at Hendon on the loss of a brother officer. As Hon. Com. in Chief of the Auxiliary Air Force, he had come to present the Esher Trophy. This trophy was awarded annually on a very strict system of marking in all subjects of the Auxiliary Air Force training which ensured a very high standard of efficiency being maintained. The trophy had been won by squadrons founded as long ago as 1926, and the fact that No. 604 Squadron had won it in the third year of its existence must be a cause of pride to Wing Com. Dore and the officers of the Squadron. The development of the Auxiliary Air Force was very creditable and encouraging, which was shown by two instances last year; at the Air Force Display three of the items were handed over to the Auxiliary Squadrons, and at the Air Exercises the Auxiliary Squadrons also took a prominent part. His Royal Highness congratulated the Squadron on their victory, and he knew they would like him to refer to the help which had been given by the County of Middlesex Territorial Army and Air Force Association.

THE PRINCE AT HENDON: Air Marshal H.R.H. the Prince of Wales on arriving at Hendon was received by Air Marshal Sir Robert Brooke-Popham (extreme left); Sqd. Ldr. A. S. W. Dore (Hon. Wing Com.), Commanding 604 Bomber Squadron; Marshal of the Royal Air Force Sir John Salmond; Air Com. MacNeece Foster, and Group Capt. Leckie (left to right).

The Vickers "Viastra" has only just been delivered to the Prince of Wales. It is powered by two Bristol "Pegasus" 1-m. engines, is fitted with wireless, and will have above each seat a Gregory-Quilter parachute as soon as this type has obtained Air Ministry sanction. The fuselage is painted silver, scarlet and blue. Earlier in the day the Prince of Wales flew in this machine from Windsor to Cardiff, a distance of 110 miles, in 54 min., which gives a cruising speed of 122 m.p.h.

Among others present were Capt. F. E. Guest, Air Vice-Marshal Sir Tom Webb-Bowen, Air Vice-Marshal and Mrs. B. C. H. Drew, and Wing Com. A. H. Orlebar.

The Everest Photographs

ON Wednesday, May 17, Col. L. V. Stewart Blacker opened an exhibition at the Ilford Galleries, 101, High Holborn, London, of photographs taken during the Houston Mount Everest flight. Referring to some of the photographs he drew attention to mysterious shapes which were difficult to account for and which might be taken to be the benign spirits of Everest due to which, according to the Hindu mystics, the party was able to return safely after their flights. Despite the excellence of the photographs Col. Blacker denied that he was anything but an amateur at photography, as he had only to press the trigger and the Williamson camera and Ilford photographic material did the rest. Sir Ivor Philipps, Chairman of Ilford, Ltd., in asking Col. Blacker to open the exhibition, drew attention to the fact that the idea of photographing Mount Everest from the air originated in Col. Blacker's mind, and was made possible by Lady Houston's generosity. The photographs which are on view, number fifty, and give a comprehensive survey of the work done by the expedition. They start with some photographs of the personnel and equipment, including an interior view of the Houston-Westland machine, taken at Yeovil before the departure of the expedition. One of the most awe-inspiring photographs is an infra-red photograph of the Mount Everest range taken at a distance of over 100 miles and at an altitude of 22,000 ft. The plain can be seen dimly in the foreground below a vast bank which fills the intervening space to where the peaks rise up in all their grandeur. Infra-red plates appear, for work like this, to give the photographs greater depth, more realism and make them as it were, more alive, which is not surprising when one realises that it is possible with these plates to get photographs even through quite thick haze. We ourselves published the earliest photographs taken from the air on Ilford infra-red plates in FLIGHT for September 2, 1932. For land work where the view includes trees and grass the infra-red plate often produces a very unusual looking photograph, but for these photographs of Everest they appear to be far better than ordinary panchromatic plates. No. 44 is of particular interest and is described as "photograph taken with one of the vertical cameras, showing the head of a glacier immediately under Mount Everest Massif," but it is really very difficult to single out any special photographs. They are all so wonderful, and we advise all our readers to see the exhibition which will remain open for the next three weeks.

New Irish Transport Director

THE Irish Free State Government has appointed Mr. T. J. Flynn, who has been Assistant Director of Transport in the Department of Industry and Commerce, to the Directorship of the Transport and Marine Branch, which controls civil aviation in the Free State, in succession to Mr. J. Ingram, who has recently retired.

THE ROYAL AIR FORCE

London Gazette, May 16, 1933.

General Duties Branch

Pilot Officer on probation R. G. Browditch is confirmed in rank (April 8).

The following Pilot Officers are promoted to rank of Flying Officer :—P. Bathurst, W. A. W. Jameson (since deceased) (April 9) ; B. G. Govett (May 9).

Flight Lt. E. A. Sullock, A.F.C., is transferred to Reserve, Class C (April 6) (substituted for *Gazette*, April 18).

Medical Branch

Flying Officer R. L. Raymond, M.B., Ch.M., F.R.C.S. (E.), is promoted to the rank of Flight Lt. (May 8).

ROYAL AIR FORCE RESERVE

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

J. Grierson is granted a commn. as Pilot Officer in Class A (April 28) ; J. F. McKenna is granted a commn. as Flying Officer in Class A (May 5) : Flight Lt. G. C. Walker is transferred from Class A to Class C (May 15). The following Flying Officers are transferred from Class A to Class C :—H. F. Suren (Jan. 8) : H. A. Francis, A.F.C. (April 24) ; A. Cairnie (May 15).

The following are transferred from Class AA (ii) to Class C :—F./O. S. H. R. Clarke (Nov. 21, 1932) ; P./O. on probation D. L. Rawnsley (April 30). Flying Officer R. H. Cave Penny relinquishes his commn. on account of ill-health (May 17).

SPECIAL RESERVE

General Duties Branch

The following are granted commns. as Pilot Officers on probation :—B. G. Corry (April 9) : R. T. Corry (April 10). Flying Officer Hon. F. A. I. Eveleigh de Moleyns resigns his commn. (May 19, 1932).

AUXILIARY AIR FORCE

General Duties Branch

No. 602 (CITY OF GLASGOW) (BOMBER) SQUADRON.—Flying Officer J. K. Horsburgh relinquishes his commn. on completion of service (March 14).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :

General Duties Branch

Squadron Leaders : T. A. Warne-Browne, D.S.C., to No. 811 (F.T.B.) Sqdn., 8.5.33, to command. M. B. Frew, D.S.O., M.C., A.F.C., to No. 111 (F.) Sqdn., Hornchurch, 11.5.33., to command, *vice* Sqdn.-Ldr. E. R. Openshaw. C. E. W. Foster, to No. 801 (F.F.) Sqdn., 9.5.33, to command. B. E. Harrison, A.F.C., to No. 821 (F.S.R.) Sqdn., 6.5.33, to command.

Flight Lieutenants : M. C. W. C. Flint, M.C., to No. 4 (A.C.) Sqdn., S. Farnborough, 8.5.33. G. R. Oliver, to Station H.Q., Boscombe Down, 11.5.33. E. J. Protheroe, to School of Tech. Training (Men), Manston, 6.5.33. H. L. Beatty, to No. 23 (F.) Sqdn., Biggin Hill, 27.4.33. J. E. W. Bowles, to No. 822 (F.S.R.) Sqdn., 5.5.33. R. J. M. De St. Leger, to No. 810 (F.T.B.) Sqdn., 8.5.33. H. C. V. Jolleff, to Administrative Wing, Halton, 5.5.33.

Flying Officers : J. S. Dewar, to No. 822 (F.S.R.) Sqdn., 6.5.33. W. V. L. Spendlove, to R.A.F. Base, Gosport, 4.5.33. H. D. Primrose, to School of Naval Co-operation, Lee-on-Solent, 8.5.33. R. M. Smith, to No. 6 (B.) Sqdn., Ismailia, Egypt, 29.4.33. R. A. Beynon, to R.A.F. Base, Gosport, 8.5.33. P. Heath, to R.A.F. Base, Gosport, 8.5.33. L. J. Neale, to No. 32 (F.) Sqdn., Biggin Hill, 10.5.33.

Pilot Officers : E. B. C. Davies, to Aircraft Depot, India, Lahore, 4.5.33. R. H. A. Leigh, to No. 810 (F.T.B.) Sqdn., 6.5.33. J. T. Longman, to No. 811 (F.T.B.) Sqdn., 6.5.33. L. N. Elsner, to No. 810 (F.T.B.) Sqdn., 6.5.33.

Acting Pilot Officer W. E. Legard, to No. 3 Flying Training School, Grantham, 8.5.33.

Stores Branch

Flying Officers : B. S. Cartmel, to No. 2 Stores (Ammunition) Depot, Altrincham, 7.5.33. L. Llewellyn, to No. 4 Stores Depot, Ruislip, 4.5.33.

Medical Branch

Flight Lieutenant G. H. J. Williams, to Station H.Q., Heliopolis, Egypt, 5.4.33.

Flying Officer F. H. Peterson, to No. 4 Flying Training School, Abu Sueir, Egypt, 12.4.33.

Dental Branch

Flight Lieutenant H. D. Humphreys, to Record Office, Ruislip 8.5.33.

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty :—

ROYAL AIR FORCE

Squadron Leaders : B. E. Harrison, A.F.C., to *Courageous*, for No. 821 (F.S.R.) Sqdn., in command (May 6) ; and C. E. W. Foster, to *Furious*, for No. 801 (F.F.) Sqdn., in command (May 9).

Flight Lieutenants : J. E. W. Bowles, to *Furious*, for No. 822 (F.S.R.) Sqdn. (May 5) ; and R. J. M. De St. Leger, to *Courageous*, for No. 810 (F.T.B.) Sqdn. (May 8).

Flying Officers : R. A. Beynon and P. Heath, to R.A.F. Base, Gosport (May 8).

Pilot Officer L. N. Elsner, to *Courageous*, for No. 810 (F.T.B.) Sqdn. (May 6).

Annual Camps and Affiliations

THE following is a list of the annual camps and the dates on which various squadrons will attend. During training pilots carry out normal service training including air pilotage, formation flying and photography. The affiliations between Fighter and Bomber Squadrons consists of the practice of offensive and defensive tactics.

(1) SUMMER CAMPS OF CADRE AND AUXILIARY AIR FORCE SQUADRONS.

Cadre Squadron.	*Camp.*	*Date.*
No. 500 (County of Kent) (B.)	Tangmere	May 7–20.
No. 501 (City of Bristol) (B.)	Manston	June 18–July 1.
No. 502 (Ulster) (B.)	Manston	July 9–22.
No. 503 (County of Lincoln) (B.)	Tangmere	July 16–29.
No. 504 (County of Nottingham) (B).	Hawkinge	July 30–August 12.
Auxiliary Air Force Squadron.		
No. 600 (City of London) (B.)	Tangmere	July 30–August 13.
No. 601 (County of London) (B.)	Lympne	July 29–August 12.
No. 602 (City of Glasgow) (B.)	Hawkinge	July 14–28.
No. 603 (City of Edinburgh) (B.)	Manston	July 16–30.
No. 604 (County of Middlesex) (B.)	Tangmere	July 30–August 13.
No. 605 (County of Warwick) (B.)	Manston	August 6–20.
No. 608 (North Riding) (B.)	Manston	August 12–26.

(2) ARMAMENT TRAINING CAMPS

No. 1 Armament Training Camp—Catfoss

March 27–May 6	Nos. 16 and 26 (A.C.) Squadrons.
May 8–June 4	Nos. 9 and 10 (B.) Squadrons.
May 8–28	No. 503 (County of Nottingham) (B.) Squadron (3 Aircraft).
June 5–July 2	Nos. 7 and 58 (B.) Squadron.
June 12–July 2	No. 500 (County of Kent) (B.) Squadron (3 aircraft).
July 24–August 27	No. 101 (B.) Squadron.
July 31–August 27	No. 99 (B.) Squadron.
September 4–October 15	Nos. 33 and 40 (B.) Squadrons.

No. 2 Armament Training Camp—North Coates Fittles.

March 27–May 6	Nos. 4 and 13 (A.C.) Squadrons.
May 8–June 11	No. 35 (B.) Squadron.
May 8–28	No. 501 (City of Bristol) (B.) Squadron.
June 19–July 23	Composite Fleet Air Arm Squadrons.
June 26–July 30	No. 207 (B.) Squadron.
July 24–September 3	No. 12 (B.) Squadron.
August 31–September 3	No. 100 (B.) Squadron.
September 4–October 8	Nos. 18 and 57 (B.) Squadrons.

No. 3 Armament Training Camp—Sutton Bridge

March 27–May 6	No. 2 (A.C.) Squadron.
May 8–28	Nos. 32 and 54 (F.) Squadrons.
May 29–June 18	Nos. 29 and 41 (F.) Squadrons.
June 19–July 9	Nos. 17 and 56 (F.) Squadrons.
July 10–30	No. 111 (F.) Squadron affiliated to F.A.A. Squadrons.
July 31–August 20	Nos. 3 and 23 (F.) Squadrons.
August 28–September 17	Nos. 1 and 43 (F.) Squadrons.
September 18–October 8	Nos. 19 and 23 (F.) Squadrons.

(3) AFFILIATIONS OF R.A.F. FIGHTER TO R.A.F. BOMBER SQUADRONS

Squadron	*Affiliated to*	*Date*
No. 1 (F.).	No. 101 (B.) Squadron at Andover	May 1–28.
,, 19 (F.).	No. 100 (T.B.) Squadron at Donibristle	July 3–16.
,, 43 (F.).	No. 12 (B.) Squadron at Tangmere	April 24–May 7.
,, 54 (F.).	No. 35 (B.) Squadron at Bircham Newton	July 3–16.
,, 111 (F.).	No. 35 (B.) Squadron at Bircham Newton	June 12–25.

(4) AFFILIATIONS OF R.A.F. FIGHTER SQUADRONS TO R.A.F. FLYING BOATS SQUADRONS

Squadron	*Affiliated to*	*Date*
No. 29 (F.).	No. 201 (F.B.) Squadron, Gosport	two weeks during period May 1–28.
,, 56 (F.).	No. 204 (F.B.) Squadron, Roborough	two weeks during period September 1–30.

(5) AFFILIATIONS OF R.A.F. FIGHTER SQUADRONS TO R.A.F. ARMY CO-OPERATION SQUADRONS

Squadron	*Affiliated to*	*Date*
No. 23 (F.).	No. 2 (A.C.) Squadron, Sutton Bridge	April 17–23.

(6) AFFILIATIONS OF FIGHTER SQUADRONS OF THE REGULAR AIR FORCE TO AUXILIARY AIR FORCE AND CADRE SQUADRONS

Squadron	*Affiliated to*	*Date*
No. 3 (F.).	No. 501 (City of Bristol) (B.) Squadron, Filton	March 31–April 10.
,, 19 (F.).	No. 608 (County of Durham) (B.) Squadron, Thornaby	April 7–17.
,, 19 (F.).	No. 602 (City of Glasgow) (B.) Squadron, Abbots Inch	April 21–May 1.
,, 25 (F.).	No. 603 (City of Edinburgh) (B.) Squadron, Turnhouse	March 31–April 1.
,, 29 (F.).	No. 604 (County of Middlesex) (B.) Squadron, Hendon	April 8–16.
,, 32 (F.).	No. 504 (County of Nottingham) (B.) Squadron, Hucknall	March 31–April 10.
,, 43 (F.).	No. 601 (County of London) (B.) Squadron, Hendon	April 1–9.
,, 54 (F.).	No. 600 (City of London) (B.) Squadron, Hendon	April 1–9.
,, 111 (F.).	No. 605 (County of Warwick) (B.) Squadron, Castle Bromwich	April 7–10. / April 14–17.

R.A.F. Dinner Club

THE 11th Annual Dinner of the R.A.F. Dinner Club will be held at 8.30 p.m., on Friday, June 23, at the Connaught Rooms. Membership of the club is open to all serving R.A.F. Officers and past Officers of the Royal Air Force, Royal Flying Corps or Royal Naval Air Service. Serving Officers of the Royal Navy, Royal Marines, H.M. Army and the Dominion Forces are also eligible for temporary membership, whilst serving with the Royal Air Force. The Honorary Secretary is Squadron-Leader F. R. Wilkins, Air Ministry, Kingsway, W.C.2, from whom particulars and forms of application for membership can be obtained.

AIRCRAFT COMPANIES' STOCKS AND SHARES

SHARES of aircraft and allied companies participated fully in the more active conditions which developed this month in the industrial section of the Stock Exchange. There have been many good advances established, and yields are now on the small side on the basis of dividends paid for the past year. The disposition, however, is for prospects rather than dividend yield to influence market prices at the present time; and it is being suggested that leading aircraft companies stand to do materially better when there is definite improvement in general trade conditions. The issue made by Hawker Aircraft this week tended to draw further attention to aircraft shares. Fairey Aviation have again been very prominent on the market view that the company is continuing to do a good business and that there are prospects of a larger dividend for the current year. Rumours of a forthcoming issue of capital are understood to be incorrect; in accordance with the announcement of some months back the company is to repay on June 1 its 8 per cent. debentures at 110 per cent. There has been a further rise in de Havilland during the month from 20s. 6d. to 21s. 6d. In this case the past year's dividend was only 2½ per cent., but for each of the two previous years it was 5 per cent. and for 1929 10 per cent. A point of interest was a rally in Handley Page preference from 6s. 10½d. to 8s. 9d. The report and accounts for the past year are due shortly. Imperial Airways have been bought on any reaction and are virtually unchanged on the month. Rolls-Royce remained very firm throughout the month. Ford Motor were rather uncertain, pending the past year's results, expected any time now. In other directions, Brown Brothers moved up from 33s. 9d. to 36s. 3d., at which the yield is on the small side; but considerably more could have been paid last year if a large proportion of the profits had not again been put back into the business. S. Smith (M.A.) issues

Name	Class	Nominal Amount of Share	Last Annual Dividend	Current Week's Quotation
		£		
Anglo-American Oil	Deb.	Stk.	5½	101
Armstrong-Siddeley Develop.	Cum. Pref.	£1	6½	20/6
Birmingham Aluminium Castg.	Ord.	£1	5	25/–
Booth (James), 1915	Ord.	£1	15	57/6
Do. do.	Cum. Pref.	£1	7	28/3
British Aluminium	Ord.	£1	5	27/–
Do. do.	Cum. Pref.	£1	6	22/7½
British Celanese	Ord.	10/–	Nil	11/6
British Oxygen	Ord.	£1	6½	32/3
Do. do.	Cum. Pref.	£1	6½	25/7½
British Piston Ring	Ord.	£1	12½	33/–
British Thomson-Houston	Cum. Pref.	£1	7	26/6
Brown Brothers	Ord.	£1	10	36/3
Do. do.	Cum. Pref.	£1	7½	28/9
Dick (W.B.)	Cum. Pref.	£10	5	121/3
De Havilland Aircraft	Ord.	£1	2½	21/6
Dunlop Rubber	Ord.	c	4	28/1½xd
Do. do.	"C" Cum. Pref.	16/–	10	25/–
En-Tout-Cas (Syston)	Def. Ord.	1/–	Nil	–/6
Do. do.	Ptg. Pfd. Ord.	5/–	Nil	2/3
Fairey Aviation	Ord.	10/–	10*	23/4½
Do. do.	1st Mt. Deb.	Stk.	8	110
Firth (T.) & John Brown	Cum. Pref.	£1	6D	5/6
Do. do.	Cum. Pref.	£1	5*D	5/–
Ford Motor (England)	Ord.	£1	Nil	8/3
Fox (Samuel)	Mt. Deb.	Stk.	5	82½
Goodyear Tyre and Rubber	Deb.	Stk.	6½	104
Handley Page	Ptg. Pref.	8/–	10B	8/9
Hoffmann Manufacturing	Ord.	£1	5	17/6
Do. do.	Cum. Pref.	£1	7½	23/9
Imperial Airways	Ord.	£1	3	27/3
Kayser, Ellison	Ord.	£5	Nil	50/–
Do. do.	Cum. Pref.	£5	6	70/–
Lucas (Joseph)	Ord.	£1	20	88/9
Napier (D.), & Son	Ord.	5/–	Nil	6/–
Do. do.	Cum. Pref.	£1	7½	21/10½
Do. do.	Pref.	£1	8A	16/10½
National Flying Services	Ord.	2/–	Nil	–/4½
Petters	Ord.	£1	Nil	7/6
Do.	Cum. Pref.	£1	7½	12/6
Roe (A.V.) (Cont. by Armstrong-Siddeley Devel., *q.v.*)	Ord.	£1	—	—
Rolls-Royce	Ord.	c	10	48/6
Smith (S.) & Sons (M.A.)	Def. Ord.	1/–	Nil	4/3
Do. do.	Pt. Pfd. Ord.	£1	7	38/9
Do. do.	Cum. Pref.	£1	7½	23/9
Serck Radiators	Ord.	£1	12½	33/6
"Shell" Transport and Trading	Ord.	£1	7½*	46/3
Do. do.	Cum. Pref.	£10	5	£11½
Triplex Safety Glass	Ord.	10/–	10E	49/6
Vickers	Ord.	6/8	4	7/–
Do.	Cum. Pref.	£1	5*	18/10½
Vickers Aviation (Cont. by Vickers, *q.v.*)	—	—	—	—
Westland Aircraft (Branch of Petters, *q.v.*)	—	—	—	—

* Dividend paid, tax free. c £1 unit of stock. D Last xd. March, 1931. A Last xd. September, 1931. B Last xd. July, 1932. E On shares of £1 denomination.

established higher prices on the hopes of dividends on the deferred shares being resumed for the current year. Dunlop Rubber units were a prominent market feature with a rise from 21s. to around 28s. during the month. This reflects the improved results, the ordinary dividend and the favourable impression created by the statements at the annual meeting. Joseph Lucas also had a large rise during the month as have Triplex Safety Glass, which were active on expectations that the company is doing well and that there are prospects of the dividend being around 20 per cent. on the capital as reduced by last year's return of capital. Despite dividends of the leading companies being up to expectations, oil shares went back at one time on the "cut" in the price of petrol; there was a good recovery later. D. Napier have been more active and moved in favour of holders. Serck Radiators rose at Birmingham from 30s. 6d. to 33s. 6d.

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THE AUSTRIAN ALPINE FLIGHT

(*Concluded from page* 489)

were flying Manfred Weiss machines with W.M. Sport engines. Von Brumowsky, whom we have already mentioned, unfortunately also damaged the undercarriage of his "Fox Moth" and had to retire.

The Master of Sempill was unable to stay the three days on account of business, but upheld British prestige by getting his "Puss Moth" into most of the hardest landing-grounds before retiring. Mr. Gibbons, on his "Klemm," set out to make as many landings as possible and had made 17 by the time he arrived at Klagenfurt. By so doing he scored 3,260 points and was leading at that time, but unfortunately had spent so much time in this way that he was unable to complete the course before sundown, thereby also being eliminated.

The winner of the first day was an Austrian, Herr S. Josipovich, on a "Klemm" K1.32 (Argus 155 h.p.). This is the same machine in which this pilot nearly won the Europa Rundflug. He gained 12,400 points in 35 landings.

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Cheaper Irvin Parachutes

THE Irving Air Chute of Great Britain, Ltd., announce a reduction in price in all types of Irvin Air Chutes, embracing the Service types manufactured of white silk, and the Caterpillar types specially designed for use in all aircraft in the light aeroplane class. The future price list is as follows:—Service Types: Service seat type, quick connector observer and back (24 ft. dia.), each £67; Back type (28 ft. dia.), £73; Training outfit (now consisting of a 28 ft. dia. main chute and a 24 ft. dia. quick connector reserve), £134. Caterpillar Types for use in Light Aircraft: Caterpillar seat, observer and back types (24 ft. dia.), £53; Back type (28 ft. dia.), £59; Training outfit (28 ft. dia. main chute and 24 ft. dia. quick connector reserve), £106. No extra charge will be made for the quick release or quick connector harness if ordered in place of the standard harness.

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PUBLICATIONS RECEIVED

Lloyd's Import Duties List. May 11, 1933. No. 6. The Corporation of Lloyd's, London, E.C.3. Price 1s. By post 1s. 2d.

Parachute "Salvator." Anonima Innovazioni Aeronautiche, Via in Lucina, 15, Rome.

Panther IIa Aero-engine. Air Publication 1428. Vol. 1. London: H.M. Stationery Office, W.C.2. Price 4s. 6d. net.

Nickel. The Attributes of Nickel Alloy Steels: 1. *Strength and Hardness with Toughness.* 2. *Resistance to Wear.* The Bureau of Information on Nickel, The Mond Nickel Co., Ltd., Thames House, Millbank, London, S.W.1.

Economic and Trade Conditions in the United States of America. Feb., 1933. Report by H. O. Chalkley, C.M.G., C.B.E. Department of Overseas Trade. No. 544. London: H.M. Stationery Office, W.C.2. Price 4s. net.]

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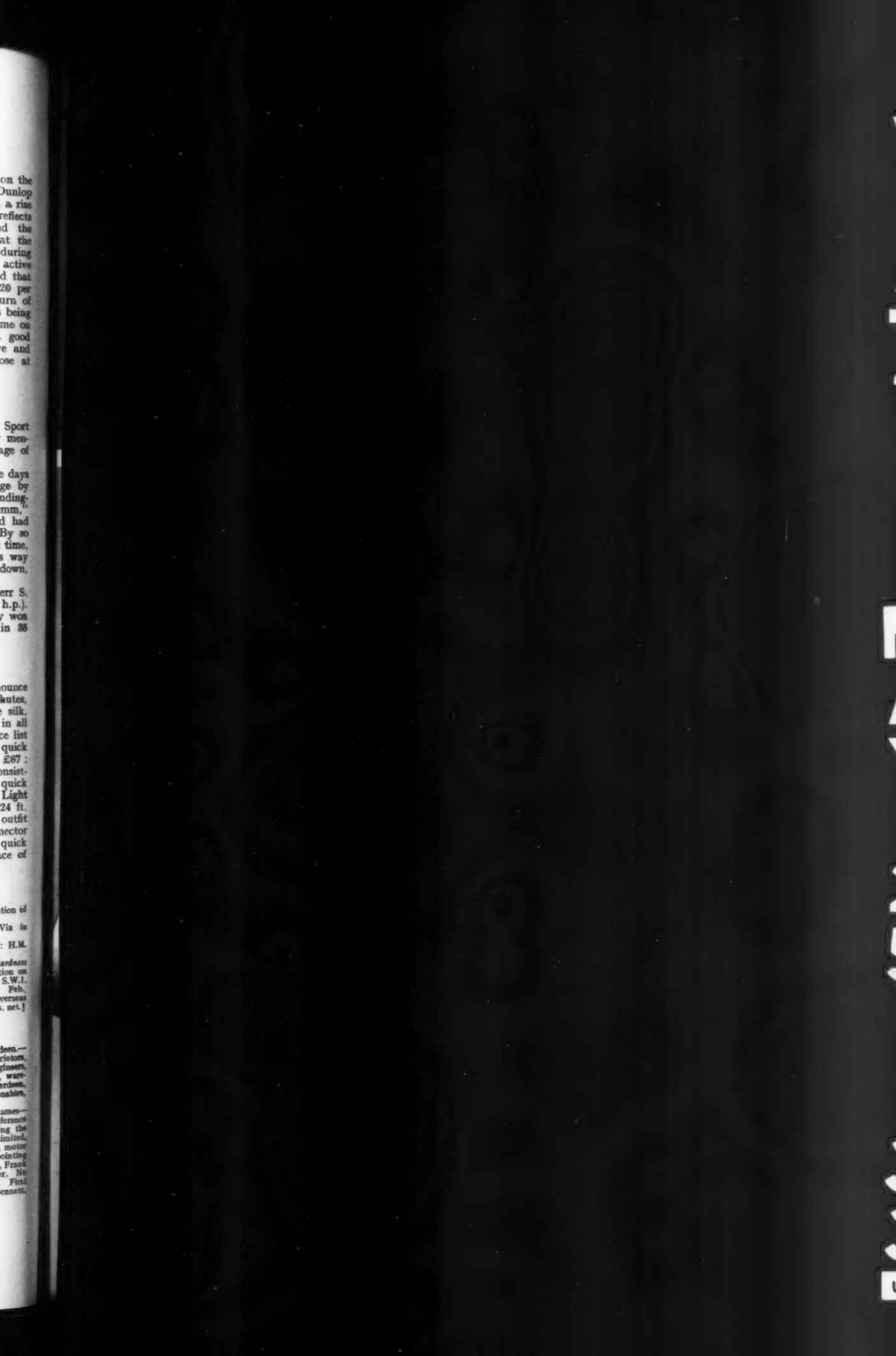
NEW COMPANIES REGISTERED

W. G. PIRIE (ABERDEEN), LTD., 15, Golden Square, Aberdeen.—Registered in Edinburgh. Capital, £2,000, in £1 shares. Garage proprietors, aeroplane and seaplane hangar proprietors, mechanical and electrical engineers, etc. Directors: Alexander T. Dawson, 21, Rubislaw Dene North, warehouseman. Alexander M. Wilson, LL.B., 15, Golden Square, Aberdeen, advocate. William G. Pirie, Viewmount, West Gulls, Aberdeenshire, engineer.

HAWKER AIRCRAFT LTD., Canbury Park Road, Kingston-on-Thames.—Capital: £800,000 in 400,000 5 per cent. redeemable cumulative preference shares of £1 and 1,600,000 ordinary shares of 5s. each. Acquiring the business carried on by the H. G. Hawker Engineering Company, Limited, manufacturers of and dealers in aeroplanes and aircraft of all kinds, motor cars, cycles, internal-combustion engines, etc. Service agreements appointing Thomas O. M. Sopwith and Fredk. Sigrist as joint managing directors, Frank S. Spriggs as general manager, and Fredk. I. Bennett as Chief engineer. No person, other than a British subject, shall be eligible as a director. First Directors: T. O. M. Sopwith, F. Sigrist, F. S. Spriggs, and F. I. Bennett. Solicitors: Slaughter & May, 18, Austin Friars, E.C.